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ABSTRACT

This report presents keynote papers and summaries of panel discussions from a conference dealing with such issues as future career patterns in the United Kingdom (UK), the impact of microelectronic technology on the workforce, and the role of education in preparing persons for careers in an information society. Verner Wheelock describes the growth of the information sector; the significance of microelectronics technology in manufacturing, conservation of energy and resources, office work, and decision support systems; and the implications of information technology in terms of employment. The text of a brief address from Kenneth Baker, the Minister of State of Industry and Information Technology, is followed by a review by Alastair Evans of changing employment patterns, such as the growth in the number of working women, and the effect of microelectronics on the unemployment level. John Anderson then describes the role of the Microelectronic Education Programme of the Department of Education and Science, and the impact of microelectronic technology on home and working life and on education. Panel reports cover the future development of careers guidance services, the impact of computers on careers education and guidance provision, the impact of new technology on work itself, education and career choice, careers and the media, and the generation of employment. (ESR)

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Careers in an Information Society

Education for the Future

Proceedings of the Bradford Conference, July 1981

Edited by Verner Wheelock

University of Bradford School of Science and Society
in association with
Institute of Careers Officers
Institute of Personnel Management
Society of Education Officers
and supported by
the Department of Industry

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Acknowledgements

The 1981 Education for the Future Conference had as its theme 'Careers in an Information Society'. The presentations proved to be of such interest that we have decided to publish the proceedings so that the data and concepts can be disseminated to a wide audience. The success of the conference was the result of the active and willing co-operation of many people, for which we were most grateful, in particular, Dr. Verner Wheelock who organised the conference and edited this volume.

In the early stages of preparation, Dermot Dick and colleagues of the Institute of Careers Officers put in much hard work in setting up two panels. It was a great pity that illness prevented him from attending the conference itself. Colin Marsh, of the Institute of Personnel Management, arranged the panel on 'The Impact of Technology on Work Itself' and persuaded Alastair Evans to make one of the keynote addresses. Michael Harrison, representing the Association of Chief Education Officers, organised the panel entitled 'School to Work – What Choices?'

Our Vice-Chancellor, John West, reeling from the announcement of a severe cut-back on University finance, gave a cordial welcome to the participants when he opened the conference. Unfortunately the Minister of Information Technology, Kenneth Baker, was prevented from making the journey to Bradford, but very promptly arranged for his speech to be circulated. Alastair Evans and John Anderson provided us with thought-provoking keynote speeches. In the afternoon sessions, all the contributors and the chairpersons in the panels, provided the participants with a variety of different perspectives.

The administration was handled almost entirely by Barbara Pickard, the Conference Secretary, ably backed-up by Marlene Ellison and Allen Wilkes. Marlene has also been responsible for most of the secretarial work associated with the preparation of the proceedings. Douglas Akroyd provided invaluable assistance in making sense of the tape transcripts. The encouragement, experience and contacts of Ed Semper, who has organised previous conferences in this series, were particularly appreciated.

On the day itself, everything ran smoothly thanks to all our exhibitors and the staff and students of the School of Science and Society.

Finally, a special word of thanks to the Department of Industry for a grant towards the cost of this publication, so keeping the price down to a reasonable level.

Tom Stonier
Professor of Science and Society

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Introduction

Verner Wheelock
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We live in an age of transition, perhaps even turbulence. In recent years society has been subjected to major changes in attitudes, values and institutions. We have become aware of a variety of major issues such as the population explosion, pollution of the environment, inner-city decay, the energy crisis, decline of major industries such as textiles and ship-building, not to mention inflation, unemployment and the economic problems. Looking to the future, the modern-day prophets emphasise how advances in new technologies such as computing and microelectronics will have profound impacts on work, home-life and leisure activities. Whatever view one takes of the different prognostications, there can be little doubt that the future will differ significantly from the past. Therefore, young people on the threshold of their careers find themselves facing uncharted territory. One of the basic objectives, therefore, of the 1981 'Education for the Future Conference' was to bring together people with a range of backgrounds, expertise and experience in an attempt to identify some guidelines for those worried about how they can tackle the future. One of the most encouraging features that emerges from an examination of the proceedings is that there are ways of coping with the enormous problems we face. But we need to understand what is happening and be very careful about the options that are selected. However, if we can harness the potential offered by the new technology, it is feasible to construct a future which is exciting and challenging. The object of this introduction is to make some personal observations which highlight the more interesting conclusions and ideas that were presented to the conference.

Not surprisingly, the overriding concern of nearly all participants was the high level of unemployment, and especially the impact it has on young people. In many areas, the chances of school-leavers obtaining a job now or in the foreseeable future are less than 50%. In Cambridge, the vacancies reported to the careers service for school-leavers may be as low as 25: 50 years ago, there were 1000 vacancies. There can be little doubt that lack of jobs can have a most destructive and demoralising effect on those directly involved, as well as those parents, teachers and advisers who are closest to the problem. Work plays a crucial role in contemporary society because it enables individuals to make a contribution to the rest of society, confers status and functions as a basis for the distribution of wealth. The implications of widespread, long-term unemployment threaten the foundations of society. On top of all this, we have the microelectronics technology which is advancing at a very rapid rate. This is leading to the development of equipment such as robots and word-processors, which is giving rise to genuine fears of further job loss. On closer analysis, however, we find that the relationships between employment and new technology are quite complex.

An examination of the factors which have affected the supply and demand for labour will help us to understand how the present level of unemployment has developed. Over the last 15-20 years, the supply has been boosted by the growth of married women coming on to the labour market, and the increased number of school-leavers caused by the post-war baby boom. But to some extent, this has been offset by the expansion of education which has resulted in a progressive increase in the numbers remaining in full-time education. The raising of the school-leaving age to 16 together with the growth of higher and further education has delayed the time at which people enter the labour pool, thus reducing the supply. In contrast, the demand for labour has declined recently because of the world economic recession. In the UK, the position has been aggravated by the persistent deterioration in the competitiveness of British industry. Quite simply, this means that a decreasing number of customers in markets at home and abroad decide to purchase goods manufactured in Britain.

If we are to gain some appreciation of what the future has in store, we must understand that we live in an economy that is dynamic. Over the past few centuries there has been a big upheaval from a predominantly informal economy in which almost all work was directed towards food production to a money-based economy with about 3% of the work-force directly employed in agriculture.

During the same period, industrial society evolved and at its height, almost half of the work-force was engaged in manufacturing industry. Today the numbers employed in industry are declining and it is gradually becoming accepted that this trend will not be reversed. However, this does not necessarily mean that output will decline because the application of technologies such as robots will result in big increases in productivity. As a consequence many observers believe we are now moving into a post-industrial society in which manufacturing industry is no longer the dominant feature of the economy. Because of the increasing importance of knowledge and information in the economy and the growth of the work-force primarily concerned with information (eg, secretaries, teachers, managers, journalists, researchers) the term information society has been coined to describe this new era. It is important to recognise that information technology will also have an enormous impact on those who are working with information. For example, the use of word-processors, which is becoming very common in offices can increase productivity for many office routines. But this is only the start, because ultimately as the technology continues to be improved and becomes much more widely dispersed, information will be stored, processed, transmitted and retrieved electronically simply because it is so much more effective and efficient than current methods. Therefore, it follows that *for the same level of business,* the work-force must be reduced. History, however, clearly demonstrates that if productivity is increased, the price of the goods can be reduced and so markets expand. One of the most dramatic examples of this phenomen is, of course, the chip itself. When this happens new jobs are created which to some extent compensate for the loss of jobs caused by the introduction of the new technology. In fact, very often it is those industries with the largest increases in productivity which are most successful in generating new employment. On the other hand, those industries that fail to invest in new plant often find it increasingly difficult to compete so that they are eventually forced out of business with the loss of all jobs.

In a dynamic economy, new jobs will be created in response to new needs that emerge in society. For example, the energy crisis has stimulated considerable research in the production of alternative forms of energy supply. As soon as these reach the point of exploitation, employment will be generated as the industries are developed. Similarly, biotechnology, which has enormous potential for providing new foods, drugs and raw materials as well as for converting solar energy and sewage into fuel, is very likely to be a source of economic wealth and substantial employment. There is absolutely no guarantee that this will happen without very positive efforts. We should take heed of the fact that one of the biggest companies moving into biotechnology – the Swiss-based Biogen – has decided not to invest in this country because it believes that cuts in university expenditure would limit the research back-up that it needs.

The crucial role of microelectronics and other new technologies is that they enable us to meet human needs much more efficiently than before. Frequently a given output can be achieved with much less input of labour, energy and raw materials. In essence this is how we create wealth – after all, if one man can produce 80 cars per year instead of 20 then everyone is (or should be) better off.

Despite the potential for the creation of new jobs there is, nevertheless, a strong possibility that the total demand for human labour will be reduced. If this does happen then the available work could be shared out in a variety of ways – the two extremes can be represented as follows:

> A proportion of the work-force (say 70%) continues in employment doing the same amount of work in their lives as at present. The remaining 30% would be unemployed
>
> The work could be shared out between everybody so that, in effect, there is full employment, but the amount of work that each individual does would be reduced by about 30%. This could be achieved by a reduction in the working week, longer holidays, sabbaticals, earlier retirement, more time spent in education, just to mention some of the possible measures

The underlying assumption is that people would still receive the same income (or more) than they get at present. With big increases in productivity this would be perfectly feasible.

To put these scenarios into perspective we should recognise that the amount of work individuals are expected to do in their life-time has been declining steadily for generations. During the hey-day of the Industrial Revolution many children started work as early as 6 or 7 years of age. In extreme cases, they would have no choice but to spend most of their waking life at work in the mills of cities such as Bradford. This could perhaps be as high as 100 hours per week. There are still old people alive today who in their youth would have had to work up to 60 hours per week. Compare that with the contemporary situation – all children stay at school until they are 16 and many of them remain in education for a further 5-6 years. Holidays are longer and the average working week is about 40 hours.

There is nothing new about achieving big increases in productivity, and in the past society has been able to adjust. The strategy has invariably been to share out the benefits (not necessarily equally!) and the net result has been that material living standards improved and the amount of work expected of an individual was reduced (ie, work-sharing). As this strategy has proved effective in the past, is there any reason why it should not apply to the present?

Looking on the bright side, there is every possibility that the effective implementation of information technology can have enormous benefits for society but it does mean big upheavals for individuals and institutions. We must recognise fully that in one major respect, the introduction of new technology is likely to be very different from other examples taken from history – the time span is very much shorter!

There can be no question of rejecting the new technology, it is already with us and being applied – the genie is out of the bottle and cannot be forced back. The real issue is, therefore, whether we are capable of harnessing the potential of new technology and doing so very quickly, or do we allow ourselves to be overwhelmed by it.

It is clear that the implications of information technology for the education system are profound and these have been spelled out by John Anderson. Essentially the role, purpose and methodology of education are undergoing a fundamental change and it is crucial to face up to the consequences. From now on, microelectronics will play a key role in handling information and those who do not acquire the expertise to make use of a computer run the risk of being almost as handicapped as those who cannot read or write. It is vital that we learn how to exploit the computer in education, how to get teachers to adapt (not forgetting those who teach the teachers), and we have to do it fast! Resources for hardware, software and training will have to be made available on a very substantial scale. It is no good one Government Minister telling the local authorities they must provide the resources if another one is using draconian powers to persuade them to reduce expenditure. The traditional British approach of committees, working parties with endless debate, discussion and reports is quite inappropriate and inadequate. We have to get moving, support those people who have expertise and enthusiasm, accept that mistakes will be made and learn from the mistakes.

The expertise on its own is not enough, because we are desperately short of people with inclination and ability to recognise the opportunities and to take advantage of them. Many existing firms need a good shake-up in terms of market strategy, operations and industrial relations. New companies should be launched – many will fail – but the ones that are successful will play a key role in the economy five, ten or twenty years into the future.

Many people in influential positions are so overwhelmed by, or unaware of, the impact and potential of the new technology that they are unwilling to take the necessary positive steps to prepare for it. There is also a widespread belief that it is impossible to train enough people with the appropriate skills required to cope with the technology. The evidence that has emerged to date indicates that such fears are completely unfounded.

First of all, young people, in general, develop aptitudes for computers very rapidly. In many cases, they soon reach a point where they know more about using computers than do their teachers.

Secondly, there are plenty of examples of firms which have introduced computers, which are being operated successfully by staff previously regarded as 'unskilled'.

Thirdly, most typists and secretaries who have had word-processing introduced into their offices soon develop an appreciation of the benefits, such that they would not be without them.

The reality is that, used effectively, the technology has such enormous advantages that the effort needed to become familiar with it is very rapidly amply rewarded. In fact, many of the problems associated with the introduction of new technology can be traced to insensitive labour relations.

The benefits of new technology are by no means automatic. National prosperity is not a God-given right anymore than Arsenal is guaranteed First Division status in perpetuity. New technology and other national assets and resources must be harnessed effectively if society is to reap the benefits. This means that our industrial and commercial concerns must be producing goods and services for which there is a market. The market is dynamic. Products which were successful 50 (or even 10) years ago may no longer be in demand. For example, in the USA, the sales of high fuel consumption automobiles or 'gas guzzlers' plummeted after the petrol shortage of 1979. Simultaneously sales of small efficient cars expanded. Because the US motor industry was unable to meet the altered demand, it encountered serious financial difficulties – Chrysler, in particular, only just survived. By contrast, Japanese and European manufacturers were in a position to provide large numbers of small cars and as a result improved their position. On the other hand, in certain areas of textiles and steel, which are dependent on ample supplies of cheap labour, UK companies can no longer compete and it probably does not make good sense to do so.

Therefore it is clear that any company, large or small, will survive only if it is capable of responding to changes in the market. Individual firms must be continually alert to identify new markets in the light of new technology, availability and cost of inputs such as labour and raw materials, changing attitudes and values of consumers.

The successful companies of the future are likely to be 'mean and lean'. Because of the high cost of employing staff (overheads as well as wages) and the difficulties of firing employees who no longer justify their existence, the full-time permanent staff will probably be kept to an absolute minimum. Therefore many of the requirements for services will be filled by contracts to small companies and self-employed individuals. There may also be a growth of part-time employees and short-term fixed contracts of employment. Apart from the financial considerations, this approach enables a firm to be much more flexible and adaptable than if the services are provided in-house. Although contracts may appear to be expensive, they can easily be changed or cut off altogether.

It is inconceivable that all industrial and commercial firms will be capable of making the necessary adaptations to guarantee survival. Therefore they will collapse and die. This is not necessarily a disaster for society as a whole, provided new seeds are being sown, some of which will grow and mature into major concerns of the future. This is one of the important mechanisms by which an economy evolves so that it can adjust to changing circumstances and is capable of identifying and filling new niches as they emerge in the market place. In doing so, of course, new jobs are created. Within the microprocessor industry itself, new companies are being launched continuously. Undoubtedly many of them fail but there are some notable successes and the rate of progress is extremely rapid.

The implications for careers are quite profound. Undoubtedly there will still be major organisations which will recruit young staff, who will stay in the same employment for their entire working life. There are compelling reasons for concluding that the opportunities for this type of career will decline markedly. Even within one firm, the nature of the work is highly likely to evolve and change. Staff will have to acquire new skills and knowledge at regular intervals throughout their period of employment if they are to cope effectively.

However, the majority of people will probably have a much less sheltered existence than those who stay with a single employer. Based on his experience in the computer industry, Julian Harrison has explained that individuals do not spend their lives climbing promotional ladders, but move around almost continuously. They need to have breadth and adaptability to recognise opportunities as well as sound judgement and self-confidence to grasp them when they arise.

Similar skills and attributes will be required by the self-employed, who undertake contracts and consultancies on a fee-basis. To be successful under these circumstances it is essential to keep at the forefront of technologies and concepts relevant to the field of interest. Such individuals fulfil a crucial role in the evolutionary process because they have to be capable of introducing new ideas into their clients' thinking.

Most people who achieve success in the formal education system are conditioned to expect a job when they leave. On the other hand, many of the so-called 'failures' at school and even at college and university turn out to be highly successful entrepreneurs. In view of the potential importance of such individuals in a dynamic economy, surely we must do better than this. One of the major challenges for the education system will be to help individuals develop confidence in their own abilities and acquire skills which will enable them to carve out their own career patterns instead of relying on other people and organisations. At worst, the formal education must not discourage those who have a natural inclination to do so.

One of the encouraging notes is from Norman Lloyd who told the conference that several recent graduates from Aberystwyth launched businesses which are now thriving. Hopefully, the significance of this will not be lost on others in careers advice at all levels. They might also find Geoff Wood's paper worth reading. In it he describes the courses now being run in Sheffield for people who want to get started in business. There must be many of his former students who now look back and regard redundancy not as a disaster but the best thing that ever happened to them.

Careers in an Information Society

Background Paper

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We live in an 'information society' – a term which has been coined in recognition of the fact that more than half the work-force is now in jobs where the work is mainly concerned with information. These include scientists, technologists, teachers, journalists, planners, managers, buyers, government administration, secretaries, filing clerks, data processors.

In the present century, despite the growth in the number of people working with information, the method of dealing with information has remained virtually unchanged: pencil and paper are still absolutely basic.

But not for long: micro-electronics and associated new innovations are providing a new tool – information technology (including computers, robots, word processors, electronic filing, electronic mail) – which is transforming our ability to store, transmit, process and access information.

As a consequence, there is the potential to obtain very substantial increases in productivity throughout the economy. In the manufacturing sector, this could give rise to factories which are completely automated. For some functions in offices, it is possible to double or treble labour productivity with equipment already in existence. The new technology can be used to reduce waste, eliminate pollution and improve the efficiency and utilisation of resources such as energy.

In essence this means that the new technology can create wealth. If we decide to do so, this wealth can be used in a variety of different ways, including:

- development of the telecommunication network, which in any case is essential for information technology
- extending the range of educational opportunities – including a comprehensive system for adult education
- research and development – essential investment for the future
- improvement of the housing stock
- restoration of buildings of historic interest
- re-building the sewerage system which is falling apart
- conservation of energy
- development of alternative methods of energy production
- reducing pollution
- restoring derelict land
- constructing leisure/sporting facilities
- reduction in the time at work – shorter working week, longer holidays, earlier retirement.

All of these approaches would create employment.

It is crucial to recognise that most of the current unemployment in this country is because of the failure to be competitive in world markets and NOT because of the impact of new technology. In fact, new technology is a key factor enabling firms to be successful in the market place – so they survive and maintain some employment. Firms which ignore the new technology often have difficulty maintaining their position. If they go out of business then all the jobs are lost.

Adopting the new technology can mean big changes in a well-ordered routine. Many skills become obsolete so that some jobs are lost completely. Jobs likely to be affected include accountants, billing clerks, cashiers, draughtsmen, key punchers, library assistants, machinists, mail carriers, material handlers, meter readers, proof-readers, sales clerks, telephone operators, telephone repairmen, TV repairmen.

By contrast, new jobs will be created and therefore it is essential that opportunities are made available for people to acquire new skills.

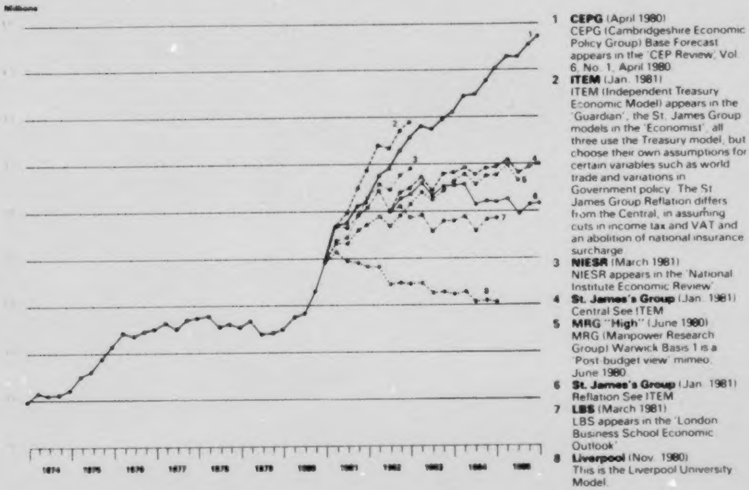
It is likely that many jobs which are not made obsolete will undergo substantial changes so that very many individuals are likely to be faced with the prospect of adapting to the new technology and acquiring new skills.

It will require very positive action on the part of government, organisations and individuals to ensure that the new technology is introduced effectively and humanely. If this can be achieved then there is the prospect of an exciting, stimulating and challenging future.

Fig 1

Comparison of Forecasts of Total Unemployment

(Great Britain, excluding school leavers, not seasonally adjusted, quarterly averages)



1 **CEPG** (April 1980)
CEPG (Cambridgeshire Economic Policy Group) Base Forecast appears in the 'CEP Review', Vol 6, No. 1, April 1980

2 **ITEM** (Jan. 1981)
ITEM (Independent Treasury Economic Model) appears in the 'Guardian', the St. James Group models in the 'Economist', all three use the Treasury model, but choose their own assumptions for certain variables such as world trade and variations in Government policy. The St James Group Reflation differs from the Central, in assuming cuts in income tax and VAT and an abolition of national insurance surcharge

3 **NIESR** (March 1981)
NIESR appears in the 'National Institute Economic Review'

4 **St. James's Group** (Jan. 1981)
Central See ITEM

5 **MRG "High"** (June 1980)
MRG (Manpower Research Group) Warwick Basis 1 is a 'Post budget view' mimeo, June 1980

6 **St. James's Group** (Jan. 1981)
Reflation See ITEM

7 **LBS** (March 1981)
LBS appears in the 'London Business School Economic Outlook'

8 **Liverpool** (Nov. 1980)
This is the Liverpool University Model.

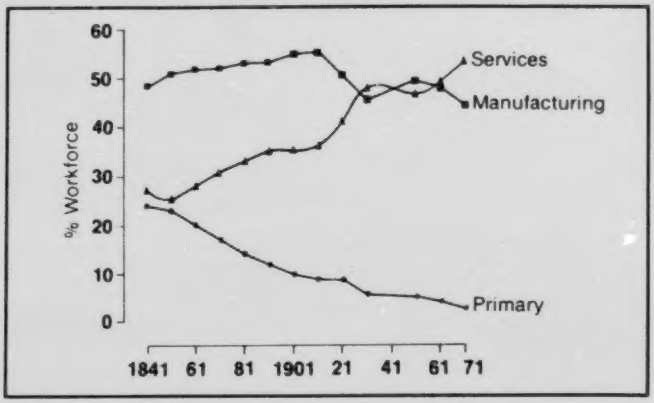
Unemployment in the country as a whole is approaching three million. Opportunities for school-leavers have been slashed so that in some areas, the chances of finding employment are less than 50%. There is almost unanimous agreement between the forecasters that unemployment will still be 2.5 – 3 million in 1984/5, (Figure 1). At the same time shots on television show factories which are completely automated. There is therefore a tendency to link the two factors and blame technology for the unemployment. In reality, of course, the relationships are complex.

The purpose of this paper is to provide a background for those who will be participating in the 1981 Education for the Future Conference at the University of Bradford. It is hoped that the paper will contribute to the development of a framework within which the Conference discussions can take place.

THE INFORMATION SOCIETY

About 500 years ago, probably 90% or more of the work-force was engaged directly in food production. Today in Britain, the primary sector (agriculture, fisheries and forestry) consists of about 3%, (Figure 2). Therefore there has been a phenomenal reduction in the number of people engaged in farming. This shift has only been possible because of the application of knowledge which has resulted in staggering increases in agricultural productivity. In fact, this was an essential prerequisite for the development of manufacturing industry, because it freed large numbers of people for employment in other areas. As the Industrial Revolution progressed, there was a steady increase in the proportion of people employed in manufacturing. The value levelled off at about 45% and in recent years has declined slightly. Over the years the tertiary or service sector has increased steadily.

Fig. 2 **UK – Sectors of Employment, 1841-1971**

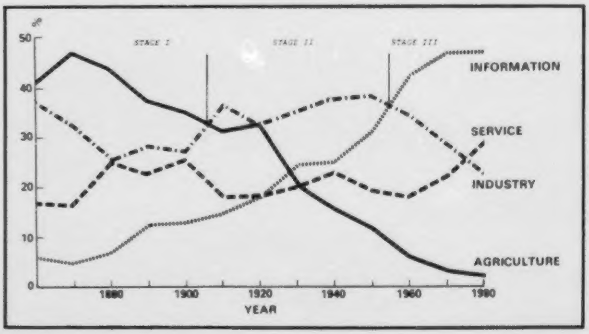


The system of classification used in Figure 2 is useful for showing some of the major changes which have occurred in employment patterns. However it is essentially based on what is produced and is therefore limited in presenting an understanding of the jobs people actually do. It is becoming recognised that the major factor contributing to the changes in employment and the economy is knowledge or information. For example, the chemical industry is largely dependent on the application of fundamental chemical principles established in the laboratory. The micro-electronics industry would never have been born if it were not for the research and development stimulated by the space race and paid for by the US Government. By contrast, many of the earlier industries were developed with a minimum of what we would now regard as R & D.

In an attempt to quantify the scope of information activities in the economy, Marc Porat (1977) has used official US statistics to identify individuals who are primarily concerned with information in their work. The term 'information operative' has been used to describe them and Table 1 shows the framework that Porat has devised to classify the different categories of information workers. Broadly speaking, they include those who produce, process, store and distribute knowledge/information. Porat's analysis shows that as far back as 1967 more than 50% of wages and salaries were paid to those working in the information sectors. Figure 3 shows that there has been a steady growth in the proportion of the work-force in the information sector and that by 1967 it was by far the major type of employment. The indications are that similar changes are occurring in UK even though they may be a few years behind the US. This therefore is the basis for the use of the term 'information society.'

Fig 3

Changes in the proportions of the US work force in agriculture, industry, services and information sectors 1860-1980



(Source – Porat, 1977)

INFORMATION TECHNOLOGY

Essentially, as the term implies, information technology is the application of technology to information. A computer may be regarded as an information machine because it can store and process information. As the use of computers becomes more and more widespread they are likely to achieve a dominant position in dealing with information. With rapid advances also occurring in communications technology, computers and their peripherals can be linked together so that information can be transmitted around the world almost instantaneously. In France the word telematique (telematics in English) has been used by Simon Nora and Alain Minc (1980) to describe this convergence of computers and telecommunications. Anthony Oettinger (1980) of Harvard has suggested an American version – compunications.

The major reason why information technology has come to the fore is the very rapid advances in semi-conductor technology resulting in the development of the microprocessor or silicon chip. This means that the cost of computing power has

Table 1 **Typology of information workers and their renumeration (US 1967)**

MARKETS FOR INFORMATION	**Total wages & Salaries ($ millions)**
Knowledge Producers	**46,964**
Scientific and technical workers (eg. chemists, economists, engineers)	
Private information services (eg. lawyers, farm management advisers, computer programmers, financial managers)	
Knowledge Distributors	**28,265**
Education (teachers)	
Publication Information Disseminator (eg. librarians)	
Communication workers (eg. journalists)	
INFORMATION IN MARKETS	
Market Search and Co-ordination Specialists	**93,370**
Information gatherers (eg. meter readers, surveyors)	
Search and co-ordination specialists (eg. buyers, insurance agents, salesmen)	
Planning and control workers (eg. office managers, health administrators)	
Information Processors	
Non-electronic based (eg. proof-readers, filing clerks)	**61,340**
Electronic based (eg. bank tellers)	
INFORMATION INFRASTRUCTURE	
Information Machine Workers	**13,167**
Non-electronic machine operators (eg. bookbinders, compositors)	
Electronic machine operators (eg. calculating machine operators, office machine repairmen)	
Telecommunication Workers (eg. telephone operators, TV repairers)	
TOTAL	**243,106**
(53% of the total for all employees)	

(Source: Porat, 1977)

been reduced very significantly within the last two decades, so that it is not cost-effective to utilise computers for purposes that previously would just not have been economically feasible. These include:

> New or improved products such as electronic calculators, digital watches, microprocessor controlled washing machines, electronic cash registers
>
> Office equipment. Word processors are now being introduced into offices throughout the country. However this is just the beginning as far as the office is concerned since word processing is likely to be followed very soon by electronic filing and electronic mail.
>
> Manufacturing industry. The use of automatic equipment on assembly lines culminating with robots, for example.

THE POTENTIAL OF INFORMATION TECHNOLOGY

Much of the discussion of microelectronics is characterised by fear of the technology itself, perhaps stimulated by a feeling of inability to cope with it, and fear that it will displace labour. Undoubtedly there is some justification for these two responses but in order to obtain a balanced picture, it is crucial to appreciate just what can be achieved if the technology is applied effectively.

The outstanding characteristics of microelectronics technology are that it is:

> Cheap and getting cheaper. Robert Noyce (1977), one of the founding fathers of the industry has pointed out that integrated circuits have declined in cost by 28% as the output has doubled. Output has been doubling approximately every year. A computer costing £200,000 in 1960 could be replaced by a microprocessor in 1977 costing £50. At a time when the annual rate of inflation is normally between 10 and 20% per annum, these cost reductions are highly significant.
>
> Reliable. For many purposes, microprocessors which have no moving parts replace mechanical or electro-mechanical devices, which have. Consequently there is very little to wear out or go wrong.
>
> Flexible. Microprocessor controls can be altered very easily by simply changing the instructions. Therefore the necessity for very large batch runs is eliminated. For example, in automobile assembly orders received through the dealership network can be routed directly to the assembly line so that a motor car can be manufactured to the precise requirements of the customer. The waiting time for the new vehicle can therefore be kept to the absolute minimum, without the necessity of maintaining large stocks to meet every conceivable demand.

Manufacturing Industry

Very simply the significance of microelectronics in manufacturing industry is that it provides scope for:

new products
improved products
improved productivity

The reasons for these benefits include:

a reduction in the number of components

the use of automatic processes in fabrication and assembly robots which can if necessary remain in operation for 24 hours per day, 365 days per year

less down-time because of improved reliability and ease of switching over to the manufacture of different products

reduced wastage because the quality is uniformly high and therefore rejects are kept to a minimum

automatic monitoring of quality control also contributes to improved quality

reliability of products is improved and so reduces warranty costs

additional features can be incorporated into the products.

The potential can perhaps be best illustrated by some examples. Table 2 shows that between 1972 and 1980 the number of components in a colour television was reduced by about 50%, the power consumption was reduced to one third and the reliability was improved significantly.

Table 2

Manufacture of Colour Televisions
Changes in characteristics between 1972 and 1976

	1972	**1980**
Number of components	822	475
Power consumption	500 Watts	130-150 Watts
Weight	65 Kg	24.6 Kg
Mean time to failure – % per 1000 hours	40%	25-30%
Direct Labour	11.1 hours	3.7 hours

(Source: Jennings, 1981)

In June 1975, Singer, the US sewing machine manufacturer, introduced a radically new electronic sewing machine. It was programmed to perform any of 25 different stitches, including automatic button-holing, when the user rotated a selector dial and pressed a control button. Therefore it was much easier to operate and had a performance which exceeded anything offered by the mechanical machines available in the market. In the manufacturing process, the use of electronics enabled the company to eliminate 350 precision-made mechanical parts found in comparable mechanical machines (Shackil 1981). This represented an enormous saving in labour, capital and space.

There is now little doubt that the know-how is available to construct manufacturing units which are completely automated. Indeed this has already been achieved by McDonnell Douglas at the St. Louis plant which fabricates aeroplane parts (Ruzic, 1978). Similar plants are in operation in Japan for the manufacture of automobiles. These are a long way in front of British Leyland's Metro plant, where the use of robots is confined to a limited range of operations, leaving a substantial proportion of the work to be done by human labour. There can be little doubt that the economy, efficiency and high quality achieved in this kind of plant means that they will be introduced on a wide scale. In fact, as the cost of equipment continues to fail and the expertise becomes more widely disseminated the rate of introduction will accelerate.

Conservation of Energy and Material Resources.

Since the oil prices began to increase in real terms in 1973, they have contributed to inflation and the economic problems of many countries. At about the same time many other materials also began to increase in price. Microelectronics technology can be used to obtain much greater efficiency of utilisation of these resources. Within the manufacturing process itself, because the control can be extremely precise, much of the wastage can be eliminated.

Another area where major saving can be achieved is in energy usage in buildings. In the Massachusetts Institute of Technology, a computer controlled system was introduced to monitor and control energy use for heating, ventilation, air conditioning, lighting, security and fire alarms, lifts and clocks. The cost of installing the system was about $2 million annually which means that the pay-back period is less than 2 years. (Lund, Sirbu & Utterback, 1978). A similar approach has been adopted by Johnson Control Systems Limited who installed a computer-based energy management system in the new Nat West Bank building in London. The computer measures how and where energy is being used and ensures the best and most economical utilisation. The result is that the efficiency of utilisation has been increased from the normal 35% to 65% without any lack of comfort or amenities. The total cost of the system was £3.8 million and Nat West expect to get their money back in less than 5 years from reduced fuel bills (Anon., 1980a).

Office Work

According to data from the US, office costs are now in excess of 50% of the running costs of industry but productivity has increased by only 4% in the last 10 years. By contrast, over the same period, industrial productivity has increased by nearly 90%. In fact, data from IBM (Engel et al, 1979) indicates that the cost of producing one business letter has increased by 40% since 1970.

On the other hand the costs of information technology are coming down very rapidly and therefore offer the means of combatting increased office costs. As time goes on and staff wages continue to increase, the costs of the technology will continue to decline and so the pressure to take advantage of the new technology will become irresistible. For many businesses this may be the only way to survive. In the public service, savings in the cost of administration could release resources for environmental improvement, health care and education.

The introduction of word-processors, which are now common-place in many offices in the UK, is essentially the first step along the road to the electronic office. The main difference between a word-processor and a conventional typewriter is that the key-stroke is separated from the printing. This means that when the operator strikes a key, the appropriate signal is displayed on the visual display unit (VDU) and an instruction is stored on the memory. Corrections can be done very quickly simply by back-spacing and typing in the correct signal. When coding is complete, the printer is instructed to print it.

Major editing operations can be done, as for example in the revision of a report which has to go through several drafts. The previous version is saved and called up onto the screen. Then it is altered as required by the author – words can be inserted or deleted. Whole paragraphs can be shifted from one position to another and the time taken is much shorter than if the manuscript had to be completely re-typed.

Enormous savings can be achieved with standard letters. For example, when a building society has to inform all its mortgage-holders that the interest rate has been altered so that their payments have to be changed, the word processor operators simply prepare a list of customers together with any specific information for the individual concerned. Then this is merged at the printing stage with the text of the letter. With a more sophisticated system, it is not even necessary to prepare the list of customers, since this could be extracted directly from the appropriate data base.

Once the information has been coded electronically it is only a small step from there to develop electronic files. Ultimately these are likely to become widespread because:

> a large volume of information can be stored in a very small space – certainly a fraction of that required for the filing cabinets that would be replaced.
>
> the information can be co-ordinated and processed very easily and quickly.
>
> the information stored in this way can be accessed readily.

In many situations it is only by using computers that large volumes of information can be handled. For example, the Open University system would just not be possible without a computer to grade assignments, keep the records and issue instructions on the packages to be sent out to the students.

There is essentially no limit to the distance between the word-processor and the printer. Therefore a computer may be linked via a telecommunications system, such as the telephone network, to a printer which could be thousands of miles away. The message is transmitted in a very short time and clearly has advantages over the conventional posting service.

Already, British Leyland has a microwave radio network which provides a framework for communication between plants. There is a cable system installed in each BL plant so that any digital device can be attached to receive and transmit data. Messages are stored in the system pending transmission. Then these are issued automatically when the addressed user logs into his terminal. Messages may be entered during the day, for transmission at less busy times during the night. Stored messages can be retained so that they can be edited for another destination or for a different purpose and re-routed. Messages may be transmitted to several selected locations simultaneously. The text is entered once and many destinations can be broadcast using the same codes. In this way BL can send information to all its dealers and distributors in one operation. In a single day the system can deal with up to 4,000 messages at any one time and individual messages may be sent out to a maximum of 300 separate addresses. (Tristram, 1980).

Decision Support Systems

It is becoming apparent that, while information technology can be used to increase the efficiency of individual operations, the really significant breakthroughs will come when the technology is used to examine and understand complete systems. Then it becomes possible to evaluate the implications for an organisation of following different strategies. This kind of background information can be very helpful for policy formulation and decision-making. The following examples give some idea of what can be achieved.

A US company involved in the production of laundry equipment had separate profit centres for manufacturing and for production. There were conflicting objectives between the two because the marketing operation required availability of ample products to enable it to respond quickly to sudden changes in demand whereas the production aimed to minimise inventory and manufacturing costs. Every month joint production and sales plans were developed for the next 12 months. Over the years a decision process had been evolved to work out a compromise between the conflict goals of sales and production.

This process took 20 days – mainly because of the enormous clerical effort involved. If an alternative plan was to be considered, then it required further clerical work of 2 to 10 hours. In total, 16,000 manual calculations were made every month – 8,000 numbers from a data base of 75,000 elements, were transcribed. These numbers gave few clues as to the likely problem areas in any particular month. The cost of calculating a single alternative meant that the managers avoided innovation and tended to limit examination to one or two plans. In practice they usually accepted the first workable plan.

The Decision Support System developed and used exactly the same input data that was currently available. The system was interactive and provided graphical output to permit far more rapid presentation and assimilation of data by managers. As a result, managers explained ideas, pointed to supporting data, focussed on details, looked ahead rather than concentrating on next month's plan and made comparisons – and in particular, explored very many more possibilities. With the manual system, there was a large cost involved in considering even one additional alternative. The system reduced the marginal effort almost to zero.

The net result was that the managers' time involved was reduced from 6 days spread over 20 days to a single half-day spread over two working days and much better decisions were obtained (Keen & Morton, 1978).

Companies which have to despatch goods are faced with a complex range of possibilities. Freight rates are influenced by factors such as origin, destination, weight, product and type of carrier. Therefore it can be very difficult to determine the cheapest method of despatch, especially as the rates continually change.

In the US, Distribution Sciences Inc has developed a database which records details of all freight rates in the US and it has a computer in the Interstate Commerce Commissions Office in Washington so that it can keep track of all rate increases as they are filed. DSI offer a service to companies who can then plug into the system, which now contains millions of rate combinations. It can cost up to $30,000 to gain access to the data base but the saving can be significant. Electrolux discovered that it was spending an average of $1.22 more for every 100lb when it despatched in loads less than 500lb. As a result of this kind of information, the company was able to reduce its freight bill by 5% between 1979 and 1978, despite the fact that carriers increased rates by 15%. Electrolux also found that it could make substantial savings if it shifted its Atlanta warehouse to Charlotte in North Carolina (Anon., 1980b).

IMPLICATIONS OF INFORMATION TECHNOLOGY FOR THE UK

Over the last 30 years or so, the UK's share of world trade in manufactured goods has been declining precipitously. *(see Table 3).*

Table 3

UK Share of World Export of Manufacturers (1950-1976)%

1950	1960	1970	1976
25.3	16.5	10.8	8.7

At the same time there has been a substantial increase in the amount of foreign goods imported into this country. Obviously these figures reflect the deteriorating competitiveness of many sectors of British Industry. Without North Sea Oil during the last few years, the situation would have been very much worse.

The options for the future therefore are quite clear, viz:

> Withdraw completely from world markets by erecting tariff barriers which would protect British industry in the home market. It would mean that the nation would have to become almost completely self-sufficient (at present we import about 35% of our food) and foreign travel would be eliminated. There must be considerable doubt as to the political feasibility of following this path.
>
> Halt the decline in competitiveness which has caused British industries to lose markets at home and abroad.

Clearly there are many factors which can contribute to improving the performance of British industry but there can be no doubt that the effective application of information technology would be highly significant. Even if the country did decide to adopt a policy of self-sufficiency, there could be little justification for rejecting the tremendous advantages presented by information technology, which have been described earlier.

IMPACT OF INFORMATION TECHNOLOGY ON EMPLOYMENT

There is not the slightest doubt that the introduction of new technology can very often be responsible for the loss of existing jobs within a given firm or industrial sector. Numerous examples could be quoted including the manufacture of colour television mentioned earlier or the application of robots to automobile assembly. Volvo introduced robots onto two of their lines and as a result a labour force of 70 was reduced to 6. Table 4 shows that it is quite common to double the productivity of secretarial staff by the introduction of word processors. Barron & Curnow (1979) have suggested that there will be job losses over a very wide range of existing forms of employment (Table 5).

Table 4 **Effect of the introduction of word-processors on office employment**

Firm/organisation	**Effect on employment/productivity**
Arun District Council	Staff reduced from 31 to 13. Output increased by 30%
British Standards Institute	Staff reduced by 33%
CEGB (Bristol)	Staff reduced by 50%, plus a 10% increase in output
General Electric (USA)	45% reduction in secretarial costs
Lever Brothers (NY)	10 employees now handle the work previously done by 42

(Source: Thornton, 1980)

Table 5

Jobs which will be lost

Accountants
Administrators
Assemblers
Billing Clerks
Cashiers
Draughtsmen
Filing Clerks
Financial Advisory
Inspectors
Key Punchers
Library Assistants
Light Electricians
Machinists
Mail Carriers
Material Handlers
Mechanics
Meter Readers
Plate Printers
Programmers
Proof-readers
Sales Clerks
Secretaries
Shipping Clerks
Stock Clerks
Telegraph Operators
Telephone Repairmen
TV Repairmen
Warehousemen

(Source: Barron and Curnow, 1979)

Nevertheless it is simplistic in the extreme to extrapolate from this kind of information and conclude that the introduction of new technology must inevitably give rise to large scale unemployment. First, the impact of the technology does not necessarily affect all aspects of the organisation and there may even be increases in the employment which compensate for the job loss. For example in the US coal mining industry the labour projections indicate that there will be no net loss of employment even though there is expected to be a significant increase in productivity at the coal face. This is because additional staff will be required to landscape the land on completion of the mining in accordance with recent legislation. Table 6 shows that within the motor car components business some developments will reduce labour but others will increase the demand for employment.

Second, one of the factors favouring the introduction of the technology is the difficulty of getting suitable staff. When Volvo introduced robots a major consideration was that the work on the assembly lines was relatively unpleasant and labour turn-over and absenteeism were high. In London there is a shortage of secretarial staff and the Greater London Council, for example, was unable to compete with private industry in the salaries offered. By introducing word-processors and increasing office productivity, it was possible to pay salaries which were much improved on what had been offered to typists.

Table 6

Effects of the introduction of different electronic components on employment in the automobile industry

Component	Technical effect	Employment effect	Time-scale
Electronic ignition	Additional component; better starting; some fuel economy	Positive	Within 5 years
Exhaust emission monitoring and control	Additional component	Positive	Not known: will depend on legislation
Complete electronic engine management system	Co-ordination of electronic ignition, fuel injection and emission control; significant fuel economy; environmental advantage	Negative: carburettor and distributor replaced with electronic part	Likely to be 15 years or more for volume and could be less for quality products
Ring main wiring	Simplification of all existing electrical systems	Negative: reduction in labour requirement in wiring vehicles. Also reduction in demand for wire and cables	Could be within 10 years
Driver information aids	Replacement of mechanical or electro-mechanical information systems with electronics: also intro' of new information systems	Mixed: Postive for new systems, negative for replacement systems	Some market penetrated already. Likely 5-10 years in volume cars.

(Source: Sleigh, Boatwright, Irwin, & Stanyon, 1979)

Third, new technology may be necessary to handle increased business and paper work without taking on additional staff. This applies to several building societies and the introduction of word-processors has not been accompanied by any reductions in jobs.

The relationship between increased productivity and a number of other factors including total output and employment has been studied by Salter (1969). Extracts from his work are shown in Tables 7, 8 and 9.

Table 7

Changes over the period 1924-50 for selected UK industries
(1924 = 100)

Industry ranked according to increases in output	**Gross output (1935 prices)**	**Total employment**	**Output per head**
1 Electricity generation	1094	351	311
2 Rubber manufacturers	568	193	294
3 Chemicals	528	272	194
4 Cutlery	434	140	312
5 Steel tubes	402	167	240
6 Glass (containers and other)	369	174	211
7 Cement	276	116	239
8 Wire and wire working	254	143	178
9 Paper and board	239	138	173
10 Paint and varnish	227	178	128
11 Spirit distilling	201	106	191
12 Iron and steel	198	142	140
13 Brushes and brooms	197	131	151
14 Hosiery and knitted goods	183	119	153
15 Linoleum	176	114	154
16 Cocoa and Confectionery	171	86	199
17 Brick and fireclay	158	111	142
18 Coke ovens	137	100	137
19 Blast furnaces	127	104	122
20 Leather	125	112	111
21 Matches	124	79	156
22 Boots and shoes	112	90	125
23 Brewing	97	108	91
24 Tinplate	86	60	144
25 Cotton	83	64	129
26 Coal-mining	73	61	120
27 Wallpaper	72	86	84
28 Jute	65	49	134
Median	175	112	151
Upper Quartile	276	143	194
Lower Quartile	112	86	128

(Source: Salter 1969)

Table 8

Changes over the period 1954-1963 for selected UK industries (Index numbers 1954 = 100)

	Industry (1958 SIC) ranked according to increases in output	Gross output	Total employment	Output per head
1	Electricity	209.5	118.0	177.5
2	Chemicals (general)	186.9	117.2	159.5
3	Toilet preparations	155.3	146.2	106.2
4	Fertilisers etc	154.3	100.5	153.5
5	Misc-paper manufacturers	147.1	109.3	134.6
6	Glass	146.8	111.0	132.2
7	Paper and board	139.4	120.5	115.7
8	Hosiery and knitted goods	136.0	98.6	137.9
9	Linoelum, leather cloth etc	135.9	120.5	112.8
10	Wire and wire manufacturers	132.9	112.2	118.4
11	Rubber	126.5	108.7	116.4
12	Non-ferrous metals	125.9	102.6	122.7
13	Steel tubes	125.7	119.3	105.4
14	Brewing and malting	123.4	111.1	111.1
15	Paint and printing ink	122.8	94.4	130.1
16	Cement	117.2	111.9	104.7
17	Footwear	113.2	84.8	133.5
18	Iron and steel (general)	109.6	103.7	105.7
19	Bricks, fireclay etc	106.1	84.6	125.4
20	Dyestuffs	105.6	83.8	126.0
21	Cutlery	103.6	95.2	108.8
22	Jute	101.0	89.8	112.5
23	Cocoa and confectionary	97.5	93.7	104.1
24	Brushes and brooms	93.3	79.3	117.7
25	Coal mining	86.9	77.4	112.3
26	Coke ovens	86.4	90.5	95.5
27	Leather	85.9	71.8	119.6
28	Cotton spinning etc	69.2	55.0	125.8
	Median	122.7	101.6	118.1
	Upper Quartile	143.7	114.7	132.9
	Lower Quartile	102.3	87.3	110.1

(Source: Salter, 1969)

Table 9

Changes in output per man-hour and related quantities for 27 industries US 1923-1950. (1923 = 100)

Ranked according to increases in output		Output	Man-hours	Output per man-hour
1	Rayon and allied products	3602	296	1217
2	Electricity	564	168	335
3	Petroleum refining	383	132	290
4	Glass products	326	137	238
5	Rubber tyres and tubes	319	102	312
6	Paint and varnishes	306	167	183
7	Pulp and paper mills	296	161	184
8	Canning and preserving	287	144	200
9	Fertilisers	240	121	198
10	Iron and steel	240	88	273
11	Ice cream	225	66	341
12	Confectionery	202	79	256
13	Hosiery	173	100	172
14	Bread etc.	171	146	117
15	Cement	163	70	234
16	Cotton goods	146	72	203
17	Meat packing	143	115	125
18	Footwear	140	83	168
19	Coke	130	101	131
20	Cane sugar refining	125	79	158
21	Non-ferrous metals	122	68	180
22	Woollen and worsted	113	55	214
23	Tobacco products	108	37	289
24	Leather	92	56	164
25	Flour etc.	90	70	130
26	Bituminous coal	88	53	167
27	Clay construction products	79	52	154
	Median	171	88	198
	Upper Quartile	296	137	256
	Lower Quartile	122	68	164

(Source: Salter 1969)

The following conclusions can be drawn from this analysis:

> Over very long periods, it is apparent that big increases in productivity are accompanied by an increase in output and in employment.
>
> Those industrial sectors which show small increases in productivity usually have a small increase or even a decrease in output and in employment over the period being studied.

By comparing the periods 1924-1950 and 1954-63 (Tables 7 and 8) it can be seen that the position of individual industries in the league tables can change quite dramatically. Despite the fact that electricity maintains its position at the top, rubber, cutlery and cement exhibit a decline. On the other hand, toilet preparations and fertilisers, which do not feature in the early period, achieve very high positions in the 1954-63 period. These changes demonstrate very clearly the dynamic nature of the economy. No doubt a corresponding table for the eighties would show a different picture again and would include several burgeoning industries for the first time.

There are strong indications that a substantial increase in productivity results in a decrease in prices of the products so that the market share is increased. Consequently the reduction in employment that would be expected if the increase in productivity was the only factor to be considered does not usually materialise. Job losses are observed, however, in declining industries which tend to be characterised by very low growth in productivity.

This analysis suggests very strongly that the application of microelectronics technology if it leads to increased productivity, as it must, will provide industries with the ability to increase output, remain viable and therefore maintain employment provided there is a market for their goods. Firms which do not take advantage of the new technology will increasingly find themselves subject to competition from other firms, not necessarily in this country, and consequently will loose markets. Eventually they will be forced out of business and their employees will be out of work.

Paradoxically, it now becomes clear that the introduction of new technology is much more likely to maintain employment than the rejection of the technology. In this context it is appropriate to draw attention to a study by the CBI, which concluded that a loss of 1% in the UK share of world markets is equivalent to the loss of 400,000 jobs. (CBI 1977).

Viewed from a national perspective it becomes clear that there are several factors which have an impact on employment. Examples of such factors include:

> **Education** Increase in the school leaving age to 15 and then more recently to 16 has prevented a substantial number of people coming on to the labour market.

Married women There has been a steady increase in the number of married women coming on to the labour market and it is likely that this will continue for at least a decade provided opportunities are available.

Length of working week A century ago, it was commonplace for people to work 70-80 hours per week. Nowadays the average standard working week is about half those figures, although overtime working remains substantial. In addition there has been a steady increase in the holiday entitlement in recent years.

Even if the productivity increases which can be derived by using microelectronics are much greater than anything which has been achieved in the past, the result will be the creation of wealth. This wealth then can be used in a variety of ways including:

Continuation of a reduction in the time spent at work. This could mean the 30.30.30 syndrome – 30 hours per week, 30 days holiday per year and a working life-time of 30 years.

Improving the infrastructure of the nation eg.

the telecommunication system which will be essential if we are to take full advantage of the information revolution.

the sewerage system which is falling apart

the housing stock

Improvement of the environment by reducing pollution, reclamation of derelict land and restoring buildings of historical merit.

Education and training – as the new technology takes effect it will be essential to provide individuals with the opportunity to acquire new skills as old skills become obsolete. A fully developed adult education system would enable people to take advantage of increased leisure time for personal development.

Research and development – investment for the future

Construction of leisure facilities

All of these measures could create additional jobs so there is no reason why employment should not be available for all who wanted to work. It must be emphasised however that this option will only be open if the nation as a whole is successful in creating the wealth to do so and this will only happen if there is a concerted effort by government, organisations and individuals.

CONCLUSION

If it is accepted that information technology provides us with the potential to solve many contemporary social and economic problems then the following questions arise:

a) What action is necessary to introduce the new technology? How should the government, organisations and individuals respond?

b) How can society cope with the changes which will result from the application of information technology?

c) Specifically how can we prepare people so that they are capable of making effective use of the new technology and of dealing with the social consequences?

Participants in Education for the Future 1981, the floor is yours!

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Education for Technology

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Minister of State for Industry and Information Technology

Delighted to be here to contribute to this important series of conferences on "Education for the Future".

As Minister for Information Technology (IT) I am only too aware of the tremendous task facing us in education; not just schools and colleges, but in industry, commerce and for all of us in our daily lives.

Perhaps I had better start by explaining what I mean by IT. It is the application of microprocessing to information handling, and one of the effects of this application is to bring about a *convergence* between previously separate disciplines and technologies, principally telecommunications, data-processing, and office machinery.

So we are talking about a sector which covers virtually every facet of living – information is the food of progress. Information is indispensable in industry, commerce, central and local government, education, health and all other services.

Let me quote from the Advisory Council for Applied Research and Development (ACARD) report to the Government. "It will eventually affect every household and occupation. It will change patterns of employment and, if the opportunities to supply new goods and services are taken, has the potential to create many jobs. This country's future trading performance will depend greatly on its ability to compete in world markets for products and services based on IT and on the rapid and effective application of such products and services by industry and commerce generally."

The current world market for IT products is estimated at about £50 billion, growing at 10% per annum in real terms. So we are talking of a world-wide demand likely to reach £150 billion by 1990. We have something like a 6% slice of this cake at the moment and must take every opportunity to grasp more. We are reasonably well placed to attack this market and must keep up with the leaders; in some cases, like Teletext and Prestel, we are already ahead. There is no reason for complacency; some 50% of our companies are still not using microelectronics in any way, either for information processing or control, or design or any other of the many ways in which efficiency can be increased.

This is the task we face; bringing the opportunities home to people and giving them the commitment and enthusiasm to grasp them. Government has a role to play in this, indeed, it is what my job is all about.

So, what is Government doing?

Many of you will know of the Microprocessor Application Project (MAP) which encourages UK manufacturing industry to use microelectronics in products and processes. We have had a Microtrain travelling the country illustrating equipment and applications.

We are developing a statutory and regulatory framework favouring the growth of IT products and services – and we have signed the European Convention on Data Privacy; there is the important provision of a national telecommunications network – we have increased BT's External Financing Limits (EFL) to £380m; there is support for the development of new products and techniques through direct support and enlightened public purchasing.

At schools level, there is the DES Microelectronics in Education Programme (MEP), John Anderson will talk about this later, and my own Department's Micros in Schools (MIS) Scheme. These projects complement one another in laying the foundations for an understanding of microelectronics and its applications. The aim of MIS is to get a micro into every secondary school by the end of 1982. Delighted to say hundreds of applications have already been received from Authorities and schools to take advantage of the scheme. Also my Department will again this year be holding a schools competition with micros as prizes – last year over 650 high quality entries were received, indicating the enthusiasm among young people.

The thrust of your conference today is on "careers in an information society". Many of you here are, I know, deeply involved with the education, advice and training given to young people. Let me focus in on this aspect of education.

All young people need an awareness of technology and an understanding of at least some of the applications. The younger this begins the better and there is much excellent work going on in our primary schools. I was recently at the preview of a Thames Television series for junior schools on "Living in the Future" – Tom Stonier was much involved – where the enthusiasm and expertise of the young people – and they were 9 years old – was remarkable. These young people will still be at work in the year 2030; let us harness their enthusiasm as many of them will go on to design and produce applications of technology of benefit to our economy and society generally.

At secondary level, awareness is also important and some hands-on experience for all is desirable. Also needed are more young people studying for the courses and the skills industry needs – in design technology, in production, in computer related engineering and in problem analysis and programming. Only about 10,000 young people study for Computer Studies at 'O' level as against half a million for English Language and 300,000 for Maths. We must give this fourth 'R' the push it needs and if courses are not up to date enough and relevant to the skills required, we must develop new syllabuses quickly. 1700 students, only, entered university to study Computer Science in 1980.

Unemployment among young people will, of course, be of great concern to all of you. The long-term solution to unemployment is more products, well-designed, well-produced, produced on time, which meet needs at an affordable price. We shall lose more jobs if we do not adapt than if we do. The impact of world recession is severe at the moment; but it must not stop us preparing young people for the jobs and opportunities which can increasingly become available. The two companies providing equipment for our Micros in Schools Scheme did not exist until about three years ago – now they are expanding at a great pace. Their markets should prove larger than the home market as they expand operations further.

We must not assume opportunities will only be available for the more academically able youngsters; the other day I visited a technology centre in Hammersmith where young people were being trained to use microelectronics in a way relevant to skills of use in the employment market. They had virtually no paper qualifications but were highly motivated, achieving above the level they managed at school and seeing the relevance of their training to future developments in business and commerce. This centre was also developing micro devices and equipment for commercial sale with the intention of providing employment and the finance to offer both further training and more entrepreneurial activity. This approach to enterprise illustrates the great resources we have among our young people provided we offer education and training they perceive as relevant to their adult lives.

The link between education and industry, with which you know my Department is closely concerned, is vital here. Industrialists can make a great contribution to the efforts of those of you in education and the careers service by forging close links which illustrate the latest developments in manufacture and commerce and the way in which knowledge gained at school relates to real life problem solving.

I have deliberately taken a very broad sweep through some of the things Government is doing and have emphasised my commitment to education for technology. Recently I announced that 1982, will be 'designated' Information Technology Year in which this approach will be pursued vigorously, encouraging awareness, experience of technological applications, supporting development where we can.

There are many areas I have not covered; particular micro applications in education, changing patterns of employment, curriculum development in schools to relate closely to the changing needs of the modern world. You have a number of experts to give their thoughts and experience on these. I want to stress the importance of grasping the opportunities of IT in order to develop markets and create wealth, along with challenging young people to contribute in this process.

As always, the education and careers services have a vital role to play in adapting to change in harness with the industrial and business community.

Impact of New Technology on Employment

Alastair Evans
Organisation and Manpower Planning
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The changes in labour patterns over recent decades are described. The growth of those in information jobs is clearly identified. Analysis of various projections for the future of employment suggests that

Employment in manufacturing will continue to decline

Demand for manual skills will decline

Employment in services will grow

Demand for managerial, professional and technical skills will grow

More people will be entering the labour force

Unemployment will remain high unless there is a dramatic change in policies

There is no clear agreement on the effect of microelectronics on employment although there can be little doubt that many jobs will be lost and there will be opportunities for new and different skills.

Skills likely to be in demand in the future include

Industrial and commercial management

Engineering, scientific and technical

Health and education

Public administration

Social and welfare services

Agriculture

Transferable craft skills (especially related to electronics)

Traditional building and construction skills

Driving skills

Keyboard skills

Process skills (monitoring, diagnosing, taking action)

Ability to establish new small businesses

INTRODUCTION

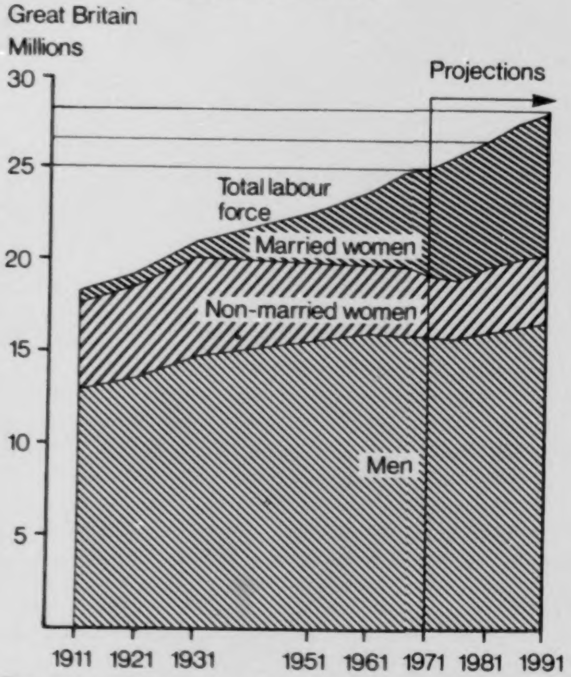
I want to consider the Labour Market over the 1980s and the implications for individuals trying to make career decisions during the decade. Then, I will refer to the impact of Information Technology on employment patterns. Finally, I will draw on the work of other people who have looked forward into the 1990s and on into the year 2000, to see what they believe will be happening to jobs and careers in the longer term.

EMPLOYMENT PATTERNS

There is expected to be between ¾ million and a million additional people entering the labour force during the coming decade to add to the three million now unemployed, Figure 1. In the seventies there was substantial growth in the workforce largely because of the rise in births, but, perhaps more significantly, because of the growth in married women in employment, Figure 2. From pre-war to just after the war, a very small number of married women were in the labour force. The number has increased progressively, more women entering career posts, more women staying on, returning to work assisted by social changes and legislation. Indeed more married women than ever now wish to work and wish to pursue careers.

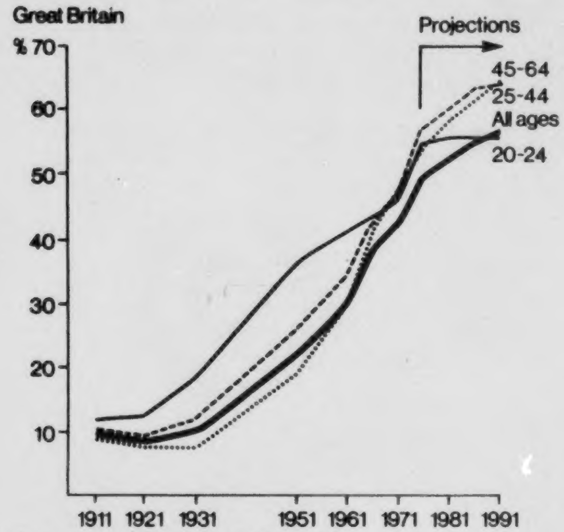
A further factor was the rise in the number of young people, following the population explosion in the late sixties and early seventies, now joining the labour force.

Fig 1 **Labour force 1911-1991**



(Source – Department of Employment Gazette)

Fig 2 **Married women's activity rates 1911-1991**



(Source – Department of Employment Gazette)

A third factor is that 65 years ago in the 1914-18 war, the births were lower and therefore there are now fewer people retiring. All these factors combine to produce this substantial increase in the size of the work force.

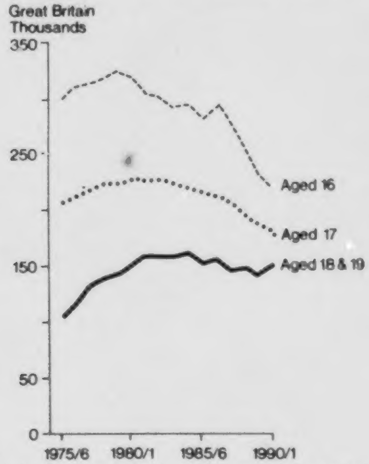
Populations in different regions are growing at different rates. In East Anglia, the working population is growing fastest, by 30% over 20 years; the South-West less so, then right down to the South-East where the population is growing slowest.

Government censuses indicate that there has been a continued flight away from the cities and towards non-urban living and towards smaller towns. Clearly the problem of job generation is going to vary from region to region.

Figure 3 refers to Department of Employment data on school leavers entering the labour force showing a peak about now, beginning to drop away slightly, with a sharp drop in 16 year old school leavers, less of a drop in 17 year old school leavers, and an increase in those leaving school and entering the labour force at 18 or 19. Over the last 15 or 20 years young people have been getting themselves better qualified for work, and this trend will continue.

One further feature of the labour force during this period is the age structure, Figure 4. From the mid 1980s, we will have one of the youngest labour forces in the UK this century, with almost 50% of the working population age group 25-44. As the numbers of jobs near the top become less, so there will be greater

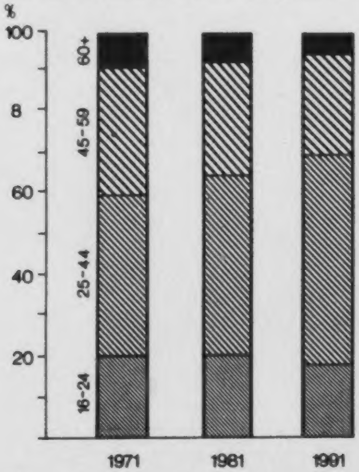
Fig 3 **School leavers* entering the labour force 1975/6-1990/1**



*Those leaving between July 1 and June 31 of the following year

(Source – Department of Employment Gazette)

Fig 4 **Age structure of the labour force 1971-1991**



(Source – Department of Employment Gazette)

competition for promotion because of this large number of people in this particular age group. Many businesses are already recognising this and are experiencing promotion blockages, particularly in the 30-40 age group. The solution is in more flexible careers with people being involved in further training and re-training. The idea of a simple upward career is becoming increasingly less possible.

The industrial composition of employment has also been changing in recent years. Over a long period, employment in primary industries (eg. agriculture, forestry and fishing) has been declining. More recently, employment in the manufacturing sector has also begun to decline.

The service or tertiary sector, however, has shown a persistent pattern of growth. Services have always been a major employer in the UK, certainly for the last hundred years. Now there is a further expansion of the service sector, and the University of Warwick Manpower Group sees the tertiary sector increasing to about 61% of employment, with the secondary sector slipping back, and the primary sector remaining the same. (Table 1)

Table 1 **Employment by Industrial Sector**

	1985
Primary	3%
Secondary	36%
Tertiary	61%

(Source: University of Warwick Manpower Group)

This has implications for the kinds of jobs and the kinds of careers available.

The growing sectors in the 60s and 70s have been public services, insurance, banking and finance, chemicals, private services, mining and quarrying, agriculture, forestry, fishing, shipbuilding, textiles, and clothing. The pattern has largely repeated itself in the 1970s. The industrial structure is changing, shifting away from a concentration of people in manufacturing, toward those in services or in information processing. This is reflected in the type of occupational structure that we have.

Between 1961 and 1985, there is a shift away from primary and secondary activities towards service, office-based employment.

Over the last 20 years, there has been about 100% growth in managerial, professional and technical employment. Amongst clerical workers, personal service workers, foremen and supervisors and unskilled manual, growth has been very marginal if not almost static. Over the same 20-year period, semi-skilled manual, skilled manual and agricultural work have been in decline.

The University of Warwick Manpower Research Group published a projection up to 1985 on some of the changes in the occupational composition. (Table 2)

Table 2 **Changing Occupational Composition 1971-1985**

	1971 %	1981 %	1985 %
Managerial & Professional	18	21	22
Engineering, Scientific & Technical	4	5	6
Clerical	15	16	17
Sales	5	6	6
Transferable Craft	13	12	12
Non-transferable Craft	4	3	3
Skilled Operative	3	3	3
Other Operative	20	18	17
Other	17	16	16

(Source: University of Warwick Manpower Group)

Managerial and professional work will continue to expand, something like 22% of the population are expected to be engaged in that kind of work by 1985 – a very marginal increase.

Engineering, scientific and technical work each show a small increase; surprisingly perhaps, clerical work also shows an increase. There may be some conflict between that and what the microchip may do, but one cannot expect an enormous impact in this short period.

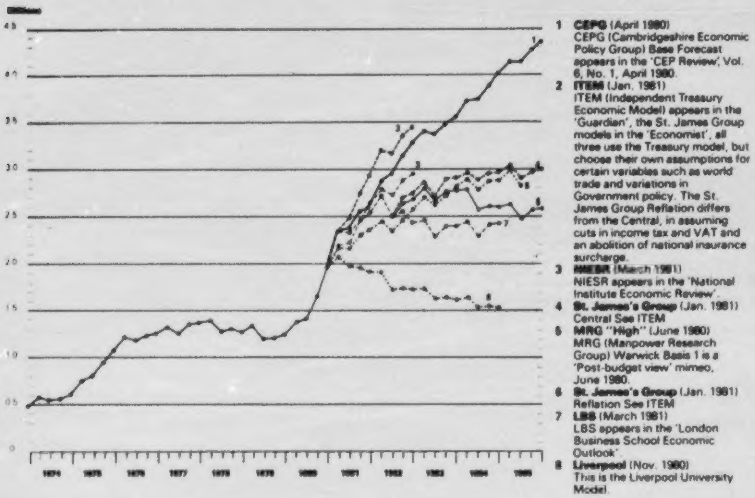
In sales work, both shop-based and selling will slow down. Demand for craft skills which transfer from industry to industry, like electrical, electronic and mechanical skills are likely to remain constant, as is demand (at least in the short to medium term) for craft-skills that are highly industry-specific. It seems likely, however, that craft skills which may be readily transferred from industry to industry are likely to grow in importance in the longer term.

The same picture emerges of continued growth in the white-collar section but at a slower rate. On the other hand, amongst manual occupations, there is expected to be a decline, possibly slightly accelerating.

From the 1960s, with the exception of the Barber boom in 1973, unemployment has risen fairly relentlessly. It is also interesting, that in 1967 we had more people actually working than we have had at any point since. The total work-force has declined continuously since 1967, with a corresponding increase in unemployment. In 1980, with two million unemployed, we can look at various predictions, Figure 5. The Independent Treasury Economic Model, the National Institute, estimates in excess of 3 – 3½ million next year. London Business School and Liverpool University, which have a different economic standpoint from most of the other forecasters, in that they support monetarism, are slightly more optimistic. A more radical view is taken by the Cambridge Economic Policy

Fig 5

Comparison of Forecasts of Total Unemployment
(Great Britain, excluding school leavers, not seasonally adjusted, quarterly averages)



1 **CEPG** (April 1980)
CEPG (Cambridgeshire Economic Policy Group) Base Forecast appears in the 'CEP Review', Vol. 6, No. 1, April 1980.
2 **ITEM** (Jan. 1981)
ITEM (Independent Treasury Economic Model) appears in the 'Guardian', the St. James Group models in the 'Economist', all three use the Treasury model, but choose their own assumptions for certain variables such as world trade and variations in Government policy. The St. James Group Reflation differs from the Central, in assuming cuts in income tax and VAT and an abolition of national insurance surcharge.
3 **NIESR** (March 1981)
NIESR appears in the 'National Institute Economic Review'.
4 **St. James's Group** (Jan. 1981)
Central See ITEM
5 **MRG "High"** (June 1980)
MRG (Manpower Research Group) Warwick Basis 1 is a 'Post-budget view' mimeo, June 1980.
6 **St. James's Group** (Jan. 1981)
Reflation See ITEM
7 **LBS** (March 1981)
LBS appears in the 'London Business School Economic Outlook'.
8 **Liverpool** (Nov. 1980)
This is the Liverpool University Model.

(Source – MSC Manpower Review, 1981)

Group, who are forecasting between 4 and 5 million unemployed by the end of the decade, unless the UK adopts import controls to protect home-based manufacturing industry. Very few forecasters, therefore, expect unemployment to fall significantly below present levels.

To summarise what is going on already:

> Employment in manufacturing will continue to decline – the result of at least two factors: one, hopefully, further investment and automation; but two, the overall loss in the share of world manufactures that the UK industry has suffered over the last thirty years.
>
> Employment in services will grow. Demand for manual skills will decline, but their nature could change. In craft skills, many people have now undergone re-training. Some people feel that we may begin to see the end of this manual/non-manual distinction during the 1980s, that we may move towards a single status for the work-force. We all clock in or we all do not clock

in – that we all have common conditions. As traditional manual skills decline in number, they are also changing and becoming new and different skills, blurring the distinction between manual and non-manual.

Demand for managerial, professional and technical skills will grow. The population will increase – by about one million, if current projections are correct.

Unemployment: the consensus seems to be that it will remain high and may get higher unless there is some kind of sudden and dramatic change of policies in all areas.

NEW TECHNOLOGY AND EMPLOYMENT

In relation to new technology, there clearly seem to be two schools of thought emerging – the conservative and the radical.

The conservatives argue that there is nothing new about labour-saving technology, nor about fears that technical change will destroy jobs. Labour-saving technology has not however created unemployment in the past; in fact, during the past 30 years we have had higher levels of employment than ever before in our history. The conservative group would argue that microelectronics will create new wealth by making available new products and new services at lower prices, creating new mass markets and, therefore, new employment opportunities. So, the introduction of new technology is essential to creating wealth and jobs. If we fail to take on board the new technology, then our competitiveness and share of current markets will decline. In the long term this would cause much more unemployment than if we adopt the technology and adopt it now.

The radicals argue that microelectronics represents a significant break with the past and herald the real era of automation. What has gone before is merely a shade of a kind of automation which is now possible – robotisation, extended computerisation, the reduction of paperwork. Investment in the new technology, which many of this school say we should do may, nevertheless, not create new jobs, despite the experience of the past that all new investment has, by and large, been employment-creating. The radicals would therefore argue that, under present arrangements, the new technology would create mass unemployment because it simply would not generate sufficient new jobs as a result. The strategy ought to be a radical re-think of the whole of employment and leisure. For example, slicing the working week, shortening working life, entering work much later, a much higher proportion of people going on to higher education, or vocational preparation, lengthening holidays with sabbatical leave, work-sharing, to cut the number of people in the labour-force. Some would go further and examine the Protestant Work Ethic. Should work be the central and most important feature of people's lives, or should leisure, which would become more plentiful, assume at least as much importance and be paid in the same way as work.

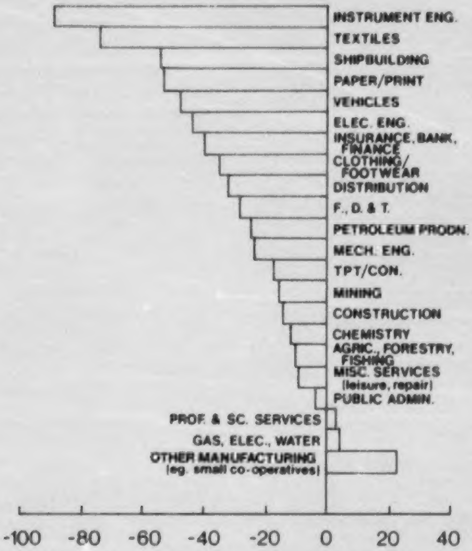
What can be said in assessment of this debate? Unfortunately, it is difficult to find accurate quantitative data – lots of subjective opinions, but very little quantitative data to provide any definite answer. It has been the radicals that have written much more in quantitative terms than those taking the conservative view. We know that microelectronics can be used to further automate manufacturing processes, to robotise many routine assembly or other repetitive tasks, to automate draughting and design work, reduce paper work in offices, increase secretarial productivity and so on. Looking at industry sector by sector, it is not difficult to say where new employment will come from. There will be new products, home-computers, electronic games, and a changed telecommunications system, giving rise to a more widespread use of transmitting and text processing terminals. Most of us cannot really appreciate, as nobody could when the electric motor or combustion engine were developed, how these might develop into mass markets for new products. And so it is much more difficult for those who argue that it is an employment-creating type of technology to actually demonstrate where this is so. The only organisation to attempt to quantify employment creation is the Arthur D Little consulting firm in the USA. They have estimated that microelecronics will create up to one million new jobs in the USA and Western Europe by 1990. Given, however, that there are now 15 million unemployed people in the USA and Western Europe this scale of job creation will be far from sufficient to solve the growing unemployment problem.

Amongst those who believe that microelectronics will reduce employment opportunities, the most detailed estimates have been produced by Jenkins and Sherman of the white collar union ASTMS. They have done this industry-by-industry, projecting what they see as change in employment as a result of micro electronics and other factors like decline in competitiveness. Looking forward to the year 2005, Figure 6, they see instrument engineering approaching 100% decline in numbers, and textiles, shipbuilding about 80%. Paper, printing and vehicles, electrical engineering, insurance and banking, all expect to be losing at least a third, if not more, of their current work-forces. Transport and communications, construction, chemicals, agriculture, various miscellaneous services, such as leisure services or repair activities, and public administration will all suffer less.

According to the Jenkins and Sherman argument, the employment impact of microelectronics will be less in certain industries, including transport, communications, mining, construction, chemicals, agriculture, certain services, and public administration, where reductions of 10 – 20% in total employment are expected.

Then they identify three growth areas; professional and scientific services, various kinds of consulting services, and gas, electricity and water. Other manufacturing, in small co-operatives or self-employment are seen as providing perhaps 24% more jobs. Their picture is generally one of fairly substantial

Fig 6 **Change in industrial employment 1980-2005**



(Source – Jenkins & Sherman, 1979)

reduction of job opportunities, with a net figure of about 23% unemployment by the year 2005.

Amongst the growing number of reports taking a pessimistic view of employment prospects, particularly in relation to clerical and secretarial employment, it is possible to find a consensus amongst a number of very different organisations. The trade union APEX say 8 million people are now employed in white-collar office-based employment, and about half a million of these jobs will be lost by the mid-1980s – not a radical loss but, nevertheless, a general erosion of some secretarial and some routine clerical work as a result of the word-processor and of a cheaper computing facility. The Conservative Political Centre suggests by the late 1980s a 40% fall in administrative jobs, clerical administrative jobs in the private sector of industry, banking, insurance and the building societies greatly affected, and two-thirds of clerical administrative jobs in the public sector will decline over that period. Finally, the Equal Opportunities Commission sees about 17% of typing and secretarial work declining during the 1980s. One could look at similar reports that have been written up in France and Germany where they are talking about similar kinds of trends – that is, a loss of clerical and secretarial jobs during the current decade.

CONCLUSION

In conclusion, the view of most researchers is that microelectronics will ultimately reduce the number of available jobs, as currently defined, although it is important to remember that we are talking about a relatively evolutionary, rather than revolutionary, process taking place over the next 20 years. It is also important to remember that microelectronics offer opportunities to acquire and deploy new and different skills, as well as leaving a number of traditional skills untouched. Skills likely to be in demand include:

Industrial and commercial management
Engineering, scientific and technical
Health and education
Public administration
Social and welfare services
Skills associated with agriculture
Transferable craft skills (especially releated to electronics)
Traditional building and construction skills
Driving skills
Keyboard skills
Process skills (monitoring, diagnosing, taking action)
Skills to enable the establishment of small businesses (either solely or in co-operation with others

Finally, it is important to remember that job losses are being calculated on the basis of today's definition of a 'job'. This usually implies a 35-40 hour, five-day week, 48 week year, and 45-50 year working life. It is obvious that over the next decade or so, these patterns will change. Weekly and annual working hours will fall, working lives will shorten (with young people entering later following a longer period of formal education and training and older people leaving earlier through early retirement) and part-time working will increase. Overall, such 'work-sharing' measures will, alongside other policies, help to bring about a return to and a redefinition of full employment.

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Acknowledgement
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Educating the Information Generation

John Anderson
Microelectronics Education Programme
Department of Education and Science

The role of the Microelectronics Education Programme is described.

The impact of microelectronics technology on home and working life is discussed and it is suggested that:

> the division between home and work will become increasingly blurred
>
> there will be increased scope for people to express their individuality
>
> progress through working life is likely to be much more varied than at present as people change their role to fulfil different functions
>
> re-training will assume a much more significant position than it does now in order to help people acquire new skills

It follows therefore that there will be major changes in the purpose of education which should be reflected in the curriculum, viz:

> because knowledge is changing so rapidly the emphasis will have to shift so that it concentrates on concepts and on the ability to handle information
>
> because of the fundamental importance of the computer everybody will need to learn how to cope with it. Computer Literacy (the fourth R?) is a skill which ought to be acquired in school

THE MICROELECTRONICS EDUCATION PROGRAMME

I want to talk about the pressure that the information revolution is creating for the educational system, and changes of direction in the school curriculum that we can see are just beginning to occur.

Because Alastair Evans summarised the radical changes so briefly it should not allow you to think that they are irrelevant or that they have small significance. The brevity highlighted how significant they were.

The Microelectronics Education Programme is not concerned with providing hardware for schools, although the Department of Industry is encouraging schools to buy microcomputers with the aim that every secondary school by the end of 1982 will have at least one microcomputer. And that is only the first stage. Very quickly schools will have many microcomputers and this is not just confined to secondary schools, but includes special schools and primary schools. So the Department of Industry scheme is complementary to our work.

Our major thrust is concerned with teacher-education, software, plus curriculum development and creation. There is no point having microcomputers unless teachers know how to use them effectively.

What makes these activities much more valuable to us is the resource-support network which we are currently establishing. MEP is in the process of initiating collaboration between local authorities which we believe is essential for the success of our efforts and to guarantee the momentum is maintained after the end of MEP in 1984. It is the local authorities who have the major responsibility for keeping education abreast of the technology – no easy task with the speed at which technology is changing.

The resource-support network – 14 regional organisations in England, Wales and Northern Ireland, spreads the developments that occur from any one teacher-group to any other teachers interested in a specific software curriculum development.

In addition to the efforts of the networks of local authorities which have agreed to share their resources, we have limited finances which we will use to help us achieve our objectives. But we also need intellectual resources and these really are very scarce, particularly in the newer fields of electronic communications technology and the electronic office. So we believe it is essential to make good use of what knowledge is available and help to get it shared.

Technology immediately comes to our aid here because the way in which we will stimulate and spread the innovations we have funded and developed (the new software, the new teaching materials, the new ideas) is through information technology itself. We have a network of word-processing systems, which communicate with each other by telephone-line and pass software and teaching material from one centre to another across the country. Thus the material is rapidly made available to teachers and other participants in the programme. In this way we hope to make the best possible use of our resources and that the advantages are felt right across the country.

Since the inception of the programme several in-service training centres, one regional information centre and curriculum development groups have been established. At all three levels we are promoting activity at the national level, at the regional level and at the individual level. Most of the finance and the stimulation available is at the regional level because we wish to involve teachers directly, by supporting their curriculum development work and facilitating access to the new material, much of which is being produced.

Above all, we believe that a national impetus is essential and we think we can stimulate it. We have initiated discussions with various key bodies, especially the examination boards. We are also talking to professionals like yourselves, who are capable of making a significant contribution.

IMPACT OF INFORMATION TECHNOLOGY ON INDUSTRY

Let us now consider some of the social and economic changes which are likely to be affected by the new information technology and examine them under the headings Industry, Community and Home.

Industry includes the infrastructure – transport, sewerage, power, water and, of course, telecommunications systems – as well as the manufacturing and service sectors. As Alastair has already shown, the new technology is likely to mean very substantial reductions in the work-forces of the sectors as constituted today. By contrast, information technology will stimulate the launching of many small companies and co-operatives.

Traditionally new business often begins life in the spare bedroom or back yard. Subsequently if all goes well they get moved off to larger premises in an old mill or on an industrial estate. I envisage that because of special characteristics and the social impact of the information technology it will be feasible and desirable for many of these businesses to stay close to the home base. This scenario will give us what has been labelled 'the electronic cottage'. Consequently we may well see industry and community coming much closer together. The clear division between home and employment, characteristics of an industrial society would be blurred. Individuals would have extensive opportunities to be flexible in their patterns of work and home life. Therefore the home will come to assume a greater degree of importance in many people's daily lives than at present. 'Home' may therefore be an all-embracing term to indicate people's life styles, as well as their work load and place of residence.

I believe that the office will become much more synonymous with the home because the technology will enable people to communicate much more readily from various dispersed locations rather than working in one central office block. That will imply many role-changes for people throughout their lives. People will not go into one job and stay in that job, but will change roles and patterns to take best advantage of the technology as it changes. Changes in industry, therefore, will be based on the changes in technology, putting a lot more emphasis on the individuality of people, and the need for people to re-train.

If we accept the concept of the 'Protestant Work Ethic' – if all of those changes in industry, in community and in the home and in life-style and in personal style occur as we think they will – then that implies a change in the Work Ethic. In schools, if we look back in history a major reason why they were established was to inculcate the Work Ethic. If we do not require that Work Ethic because we do not require regular nine to five attendance at factories and obedience to superiors, then one of the fundamental aims that underlies the school curriculum is being challenged, and it is happening now.

IMPACT OF INFORMATION TECHNOLOGY ON EDUCATION

The change in the school curricula resulting from the change in technology is an example of a tension that there is in education. The issue is epitomised by the question: 'Should schools be engaged in vocational training or in personal growth and development of the individual?' This issue has existed in the aims and objectives of the school curricula for a long time, and right now is sharpened by the impact of information technology.

On the vocational training side, there is an expectation being generated by people in industry, by parents, and even by schools themselves that schools have a responsibility to provide pupils with the skills to work in the 'data processing industry'. In other words we should increase the output from schools of computer programmers and systems analysts.

The other part of the tension, the other part of the dichotomy, the pressure on personal growth and development is coming not just from sociologists and thinkers, but from people in larger industries, who have thought rather more fundamentally about what it is they require from school-leavers. It coincides with the view of many who see society changing in the way just described and consider it essential that their children should be educated to cope with that kind of society, and have much more fundamental technological awareness. Pupils need an awareness of the nature of the revolution and they need to appreciate that the revolution is not just a hardware change. In fact, it is a change in the nature and the way by which we handle information which is fundamental to all of our activities and especially in the way we communicate one with the other. Therefore the pattern of life and work will be very different in future.

Let me give two examples of how these forces are being manifested.

First, there is pressure on the examination boards who provide Computer Studies exams to renovate their Computer Studies work, because most syllabuses are out of date. They are based on old computer technology from the 1960s, and many exams and examples of technology used refer to old mainframe technology.

The critics argue that examinations should be re-vamped so that they are in tune with the current technology. But that is much too simplistic because examination boards, by their very nature, move very slowly. With our existing bureaucratic structures, it takes years to bring about changes in syllabuses and examinations. So while it might be reasonable for them to replace in the syllabus, the magnetic core of a computer, for example, with the silicon chip, by the time they have done that the technology will have moved on. Perhaps bubble-memories will have replaced the chip, and the curriculum studies syllabus, will be as out of date as today's reference to magnetic core stores.

Much more important though is that the curricula for Computer Studies should be changed to emphasise basic concepts, the fundamental principles which do not change. That does not mean that they should not keep abreast of current technology as much as they can. It does not mean that in the current Computer Studies syllabus there is no emphasis on concepts, but they are not central – there should be a change in Computer Studies so that it emphasises the concepts that underlie electronic systems, electronics, and the binary logic of a system, rather than the particular bits and pieces that make up the latest computer technology. That kind of approach is much more important, we want to encourage our examination boards to move in that direction.

Second example – Electronic Systems, a fairly new A-level; although it has already received acceptance for university matriculation purposes as complementary to Physics for many degree courses. But it is fundamentally different in that it utilises a Systems thinking approach to teaching the subject. It does not emphasise the current technology, but concentrates on the functional flow of components in a total system using a systems analysis approach. It does not deal with the maths and physics of individual discreet components, in the way that much traditional electronics studies teaching does, but it focusses on the application of systems once they have been constructed. The concepts of the systems analysis that are fundamental to this Electronic Systems A-level are ones that are as common to the areas of Biology and Mechanics and to Thermodynamics and to Sociology as they are to Computer Studies or Electronic Systems studies. Much of the emphasis in the use of electronics in this syllabus is on laboratory and project work, and the assessment encourages the grasp of principles rather than the ability to build a workable system.

The syllabus has four parts in it, and what is very interesting is how current electronic systems technology is used to illustrate the systems analysis approach that underlies the examinations. In the Systems Component section there is an introduction to the concepts of systems as made up of interacting components – that is a fundamental description that you recognise from many fields. However, it uses the electronic systems to illustrate those parts of the system and to illustrate the principles of the system being built together.

In the section on Processing Systems, the emphasis on the study is on the storage and retrieval of information for the purpose of making decisions. Again, that is a fundamental systems concept which you could apply to many facets of life. It uses the computer as the example of a system which sorts and processes information to enable and assist human beings to make decisions.

In the Communications Systems section the fundamental systems concepts are those of the human faculties of communication – speaking and hearing, synthesising what you hear, passing it through the auditory and sensory channels. They utilise the concepts of carriers, modulation, demodulation and bandwidth which are common to electronic systems studies.

In the Feedback Systems section, the concepts are those of positive, negative, and of stable states, but it is the electronic artefacts of amplifiers and electromechanical servo-mechanisms which are used as illustrations. So that at whatever time students happen to be studying for exams they can work with the latest pieces of equipment which they can clip together and build into a system. By the time they move into industry, or into a production activity, the products themselves will almost certainly have changed but the individuals should still be able to cope because they are familiar with the fundamental systems concepts.

Schools are not very good at teaching the fundamentals of concepts and systems. The Electronic Systems A-level is an example of just one kind of A-level that we would like to see promoted much more readily across schools.

Traditionally adjustments have been made to the curriculum by continually introducing new subjects and topics. Inevitably this is self-defeating because there are clearly defined limits to the amount of material anyone can pack into the time available. We want to stimulate a debate within the examination boards in which the traditional approach adopted in subjects such as Physics can be compared with the alternative approach in which the study of systems is made fundamental as in the Electronic Systems A-level. Some contemporary O- and A-level Physics syllabuses have an optional element which relates to topics such as Computing in Electronics. However, these elements are not fundamental to the philosophy of the syllabus, they are not part of the core and they are certainly not an essential requirement. One of the highest priorities for the MEP is to encourage the examination boards to shift some of these optional elements into the centre of the school examination system. This could be one of the most important changes not only for the curriculum but for the entire education system.

It might seem reasonable that schools should prepare individuals to meet specific skill requirements of industry. However, some of the larger companies and other employers want much more fundamental changes. There is no way that schools can keep abreast of newly-emerging technology. Therefore, the function of the school must be to provide a foundation in terms of basic literacy, skills and attitudes so that the individual can cope with new technologies (and attitudes and systems) which come into existence much later.

We also have to recognise that the majority of pupils do not take examinations and that it is crucial to encourage this literacy in non-examinable subjects.

One of the first principles of the technology literacy that we need to introduce to the school curriculum is an understanding of how it works. What is the electronic system about? What is the electronic device about? What is the chip and what does it do?

Apart from the commercial aspects, what is rather more fundamental to the way career patterns are going to change is encouraging children and others to get involved in applying the chip in many ways. In Britain, we are good at inventing but not very effective at funding and financing these inventions so that the nation benefits from them. Promoting that basic understanding of how to put a chip into a device is important.

That should be the first principle of computer and technology literacy in the schools; understanding what the chip is and what it does and how it can be used, rather than understanding enough about it to contribute to the small growth of job-potential in fabricating microprocessors themselves.

Computer Literacy itself is the change of concept-basis in Computer Studies and the applications of computers, rather than just keeping abreast.

Keyboard Practice is not just a way of using typewriters, but will really be the fundamental nature of communicating information not by books, indexes or newspapers. We will use a keyboard because we will communicate the majority of our information through electronic computer-based systems.

Further we also need basic skills such as:

> the skill of understanding what happens when you put information on to an electronic data-base
>
> how to ask questions of the electronic data-base so that you get the right information out, to supply you with the information you need to make a decision
>
> how to put information into electronic data-bases themselves

Essentially the skills of information retrieval – all of these are so important, that many educators are beginning to regard them as the fourth 'R'.

This is a fundamental new input into the school curriculum which is absolutely essential. One way that the MEP is trying to achieve this objective is by the introduction of new curriculum materials and to make fundamental changes in the current subjects. Despite my earlier comments there is room for a new subject in the 9-13 age range which would not be examinable.

To sum up – we are moving into the Information Society and the syllabus must be adapted so that it incorporates the following fundamental elements:

technology literacy
keyboard literacy
information retrieval
understanding the impact on society

It is almost a truism that teachers are very conservative and do not respond well to this kind of innovation. Are teachers going to be too conservative to respond quickly enough to enable our society to adapt to the kind of career patterns that are available to us and will be inevitable if we are to make the best use of the technology, economically and socially? While the teacher body as a whole may be conservative, there are growing numbers of teachers who are very enthusiastic about new technology and are devoting time, effort and skills to promote it in their schools. As their colleagues observe what is happening, the ripples will spread far and wide.

As a professional careers group you have a very positive role to play in promoting awareness amongst teachers of the changes and of the necessity and urgency of responding to them.

The Future Development of Careers Guidance Services

Chairman: Kevin Devine

President, Institute of Careers Officers.

All of the speakers were particularly concerned about the impact of current and projected levels of unemployment on careers advice.

Kevin Devine, dealing with local authority careers services considered that the demand for information, advice and counselling is likely to grow. However, it is quite unrealistic to expect budgets to be increased. The use of computers may offer a way forward because:

> they can be used to streamline the handling of information in the office
>
> information can be made available quickly and easily for those pupils/students who need it, but otherwise are quite capable of looking after themselves

As a result, the number of individuals who need to have sessions with careers officers for advice and counselling can be reduced markedly. Therefore the officers can concentrate on those who really need help.

Joe Cookson, considered how careers advice is handled in schools and emphasised that many schools persist in according a low priority to it, despite strong evidence of the key role it can and should play. He went on to identify some of the skills which should be developed in school if individuals are to cope with education, work and home life in the future.

Norman Lloyd, as a university appointments officer, concentrated on careers advice for graduates. He explained that until recently the market for jobs had been good. Nevertheless in the last decade it has been getting more difficult in the sense that graduates can no longer pick and choose from a selection of offers. As a result student attitudes have changed. Employment patterns are also changing. For example, recruitment to the public services has declined.

Kevin Devine – Local Authorities

Looking at Britain's riots in the cities, one wonders whether our education agenda is really relevant. Could it be that the very fabric of our society is being eroded by 'unemployment'. If one accepts this grim inevitability of unemployment, then the future to me becomes less and less rosy. I am going to take a personal look at the present position of the careers service as I see it, and that will be pretty safe and factual. I have never pretended to know the answers. I am not sure I know the questions.

In the local authority careers office we are supposed to offer vocational guidance to youngsters – to provide careers, and job and further and higher education information. We are supposed to operate an employment service which with rising unemployment increasingly becomes an irony. In 1929 the City of Cambridge had 1000 vacancies for school leavers. By contrast, there can now be as few as 25 for school leavers. At the moment, we are trying to launch the Youth Opportunity Programme. We also have a responsibility to local employers. At present this can mean, for example, helping Apprentice Training Schools to survive even when there are no apprentices in them in the hope of better days to come. Behind the scenes in the careers office for example, we collect statistical information for Local and Central Government, and undertake advisory work for local schools and colleges as well as for the authority itself.

To provide this service there are staff responsible for

management and decision-making

collecting and assessing information

guidance and advice – such as helping young people decide what careers they would like to follow

placing individuals in a job on Youth Opportunity Programmes

secretarial and clerical back-up

As you can see, the careers service is very labour-intensive: about 80% of the cost of the careers service goes on wages.

A careers office is built on systems which involve, for example, personal contact between careers service staff and the clients, with great reliance on the printed word. We produce hand-outs. We also spend much time recording information – making notes about our clients, about what they are and what they would like to be, recording what we have done, and recording our activities. All of these systems add up to an almighty mountain of information.

Because the Careers Service is part of the Local Education Authority we see ourselves as educationalists and like everyone else in education we are currently being subjected to pressures. One is the pressure on the school system. I am concerned about what the examination system is doing to education. I think we have invented for ourselves a straitjacket that is now being tightened and tightened without those who invented it having the control. Youngsters do not have any need to pass examinations. Youngsters' needs are not related to some curious academic process. Youngsters' needs are related to the real world outside the school. But the pressures on the educational system have every chance of pushing the recognition of those needs right out of place, and examinations will take over and will dictate the curriculum.

If you add the financial constraints over which educationalists may have precious little control, then heaven help the balance of the curriculum. Heaven help the chances of preparing youngsters to look to the future and to take some kind of reasonable place in their working lives – or non-working lives.

We must look equally critically at practices in the Careers Service. Is the one-to-one interview a necessity, a luxury, a piece of professional indulgence? Perhaps the most important question is, is it the best way of serving the needs of youngsters at any given point in time? I am bound to say that there will always be some young people who will not be able to resolve their own difficulties without being in that sort of situation with a careers officer, but I wonder whether we have to assume that that applies to all young people. We must also acknowledge the advance of computers. Indeed, it is already being applied in quite a number of local authorities. And the other concern of mine is the pressure of unemployment on the Careers Service which makes a rather sick joke of the name "Careers Service".

We are also faced with other problems – what I would call managerial concerns rather than professional concerns. The Secretary of State for the Environment has got plans for cuts which he is about to execute for local authorities. In the case of my own authority, the education budget has to be reduced by £9m. Alternatively, members of that authority will have to have the guts to stand up and be counted by putting ninepence on the rates.

But this is a glib solution – it would mean that every employer in the country would have an 8% increease in the rates bill for his company. What chance is there of them increasing the job stock within the country? Precious little. These steps cannot any longer be taken in splendid isolation, they must be taken as part of a whole network of consequences which, in the event, comes right back to the youngsters. As employers' costs go up, so the chances of jobs for youngsters go down. And the task of the Careers Service and others involved with young people becomes increasingly difficult.

If one considers all of these costs, manpower costs, staff time, a whole myriad of things, one is increasingly bound to look at the volume of things that we have to deal with, at this vast mount of paper that I referred to earlier on, and conclude that we are in the information business.

We are probably not managing this information very efficiently. It is inevitable that we will look to the computer to help us control this, to control the costs of our exercise and in doing so help us to survive the constant pressures to which we are subjected.

The most recent pressure was a promise by the Secretary of State for Employment that unemployed young people will have had the offer of a place on the Youth Opportunity Programme by Christmas 1981. That is a wonderful political statement and bound to inspire some, but when you start looking at the reality of that, a lot of them are already full from last summer's school-leavers. What chance is there of meeting a singularly well-intentioned assurance? And that is just considering the availability of places.

They have still got to get into the supermarket called the Careers Centre, nip round the shelves, pick one of the goodies off, and get out to the checkout. The problem is we do not have enough checkout operators in the supermarket to cope with the customers. So young people are going to be even more alienated than those who were out on the streets rioting last year. I do not like having to plead the cause of unemployed youngters on the platform of law and order, as I should like to think there were better motives and better reasons for pleading the cause of the youngsters because there's no organised voice to speak for unemployed kids.

Way back in 1967, the Institute of Careers Officers produced "The Young Worker's Charter" which looks remarkably similar to the New Training Initiative now being promoted by the Government.

What about the future? I believe that falling rolls, financial constraints, curriculum reform, examination reform, are all considerations that are going to affect the shape of the curriculum and its content and what young people get out of their education. What I would like to think is that ultimately young people will leave our secondary schools with a capacity for controlling their own lives.

What we need is a much better informed input. In my mind's eye, I see the electronic careers office full of magical machines, word-processors and screens, all linked to schools where youngsters can have access to information. Let us get away from this mystique of professionalism which means that the professional has all the information here and ferrets out only what is suitable in his or her view for that particular youngster. Let us open it up, and let the kids have a look at the information. Hopefully there will be a caring person around to try to encourage realistic thought about any severe mis-matches.

So often careers education and careers advice are characterised by a process of wing-clipping. Considered against a background of unemployment this is an irony, but I do not believe that unemployment necessarily must be a backcloth against which vocational guidance is given. Unemployment, if we have the resources in terms of teaching the youngsters how to cope with it in schools, the resources in terms of the careers service to cope with it and the resources in terms of readily-accessible information, could be turned into something particularly positive.

I would like to see the careers office fulfilling a counselling role on a referral basis. Let us encourage self-help for young people. Why cannot groups of unemployed youngsters be brought together in a much more positive way than I think happens at the moment? They could spend a period in a training workshop which might function as a nerve-centre with an umbilical cord stretching out to groups of youngsters working in the community who could return to the training workshop to gain further stimulus and acquire new skills. The training workshop would be able to call on a consultant careers officer to come in and help out, or bale out, as the occasion demands. Whatever we do, whatever group we are trying to serve, we must make sure the information is available and accessible.

As those young people are part of the community we must look to the community to get more involved. Computers and information banks need to be linked to a community centre where people can actually get at what they need to help themselves control their own lives.

Joe Cookson – Schools

Kettlethorpe High School, Wakefield

The document 'The Framework for the School Curriculum' is quite explicit in that it says, for the first time, careers education is best provided by giving it a slot in the timetable. There are those who argue that it should be integrated across the curriculum. There can be a case for both approaches, and possibly the ideal is to strive for the integration of careers education in subject departments as well as having this slot in the timetable.

According to Sleigh, et al,(1979).“Information technology is likely to produce a new pattern of jobs and career opportunities which will require very radical rethinking of the school curriculum. Indeed it is by no means too soon to start this process of rethinking; the new technology is likely to reduce job opportunities for the relatively unskilled school leaver”.

If we accept that the schools need to rethink their curricula, then we must examine the ideas that are currently being formulated in a very small number of schools.

The research done for the Schools Council by Tony Watts and Bill Law has been published as a book entitled 'School, Community and Careers', in which they identify areas which should be included in the curriculum related to careers and education and guidance. These include transition-learning; developing opportunity awareness; understanding self; self-knowledge and decision-making. These aims are now beginning to be generally accepted as part of the development in careers education.

So it is clear that seeds are being sown but we still have problems.

To quote Peter Kelvin of the Department of Psychology at University College, London. “Concerning unemployment, the manifestations are well known. At a physical level, there is lassitude, a slowing of movement, a loss of tone. Psychologically there is boredom, depression, resignation. Socially there is withdrawal from social contact. Time not only hangs heavy, but much of one's sense of time seems to break down and action is, it seems, purposeless. Psychologically, one feels rejected; economically, one has limited resources and this restricts social activity. It is widely assumed that if the stigma of unemployment were to be removed, then these symptoms, these effects of unemployment, would disappear”.

Kevin Devine's approach is very much in tune with the DES publication 'Curriculum 11-16' (1977) which considers the curriculum to consist of four components:

knowledge
attitudes
values
concepts

If we accept that the knowledge will be provided by home-based computer terminals, then the schools must be responsible for developing life-skills, social skills and communication skills.

It is interesting to step back just a few years to 1973, when it was stated in a report of one of the Expenditure Committees of the House of Commons, that the provision of trained careers teachers should be a requirement in all secondary schools. It went on to say that the training of careers officers should be mandatory and a concentrated effort should be made to make girls aware of, and interested in, the range of opportunites available to them.

We are all aware that little progress has been made in recent years to achieve the limited aim of having trained careers teachers.

So we have a problem: headteachers make appointments based on subject needs. Then a teacher in another major area of work in the school is asked to take on the role as Head of Careers. Too often that role is seen as being the role of someone who is an encyclopaedia – a walking source of information. How can anyone who professes to be involved in careers education hope to succeed with that kind of philosophy? All the evidence we have in careers education shows how important it is to know how to use information, and how important it is to have a broad-based concept of careers education and guidance.

The DES (1973) recommends that careers education should prepare young people for adult life. But implicit in this is the need for young people to learn the knowledge and the skills that are appropriate for the future, including decision-making. Formulation of moral values must not be forgotten.

In-service training is vital and many authorities have already taken initiatives. In this region the Yorkshire and Humberside Consortium is very active and many other local authorities are working through their Careers Associations. That needs to be extended and it needs to be developed.

Nevertheless, a survey conducted 3 or 4 years ago showed that only one-third of careers teachers had been trained; and that a substantial number of those had only attended a one-week course. Yet the DES Survey says that they should have at least a basic training followed up by a one-year course. These are available in different colleges up and down the country. Edge Hill College is one of the forerunners in this field.

Skills are needed to manage and grow, skills that the individual needs, such as numeracy and literacy. Furthermore, there is time management, discovering one's own interests, setting and achieving goals, how to be positive about oneself. Classroom activities should be based on developing those kinds of skills.

More specifically:

Skills needed in education such as
    how to study
    how to choose a course
    how to discover education options

Skills needed for work
  how to keep and find a job
  how to change jobs
  how to achieve a balance between my job and the rest of my life

Skills in the home
  how to live with other people
  how to choose a style of living

Skills in leisure and in the community, and also, most important,

Skills of interaction and communication with other people.

So it is not just pie-in-the-sky when we talk about the need for developing careers education in relation to decision-making and self-awareness. We need to know what we mean by these terms, we need to be sure that through in-service training and by keeping abreast of developments in this sphere that we can make a significant contribution to what should be part of the core-curriculum in the secondary school.

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Norman Lloyd – Universities

Head, Careers Service, University College of Wales

80,000 graduates left polytechnics and universities this year, and about 8,000 of them are likely to be unemployed at the end of December. During the last 13 years I have dealt with students, undergraduates and postgraduates, reading arts, law, science and engineering. In that time, I have seen major changes in employer-demand, from the comfortable days before 1971 when there were never enough graduates to meet the demand, to the graduate-unemployment scale of 1971/2, then the fairly rapid recovery of the next few years and now the major cuts in recruitment we have seen this year.

Until this year the market had been extremely good for graduates. The 1979 graduates found more jobs available to them than there ever have been before. In 1980 it was not much worse. This year there have been big chops. We expect the 5% unemployment rate of last year to be 10% this year.

Alongside these changes in demand there has been a slow but steady increase in supply – 6% more graduates this year than last year. But this rise is coming to an end. In 3 years' time we are going to have 20,000 fewer graduates in universities, if all the proposals go through.

There has also been a change in student attitude. Thirteen years ago graduates were able to choose from a selection of offers. The fall in demand in 1971/2 killed that off, and since then students have become much more realistic. The heyday of sociology as a degree course has gone, there is no long hair around, people are wearing tidy clothes, conservative (with a small 'c') attitudes predominate. We used to have sneers at the industrial rat-race and the profit motive – but now it is never mentioned. What happened to the graduates and what changes are occurring at present? After the recession in 1971/2, when employers cut vacancies considerably the management pyramid began to look a little peculiar, because in the lower levels they were short of people. So, between 1973 and 1976 they started recruiting furiously to try and fill the vacancies. They found a lot of resistance, students not very interested.

The local authority boom in 1974 meant that there were lots of jobs in the public sector, so students turned away from the private sector. So employers, until now, have been doing their very best to maintain the levels of recruitment. Now they are having to cut. I expect that unemployment will not be so bad in a couple of years' time.

Only 16% of today's graduates get jobs in industry and commerce. Of the remainder, in 1979, 10% went into academic work, 15% took vocational training courses (8% of them into teacher training), and 53½% found jobs, 6½ of those are temporary jobs, some from choice, some because they couldn't get anything else. In the last year or two the numbers going into teacher training have slumped. This year figures are right up. Many get a mandatory grant and do teacher training for a year to see how things are then. One bright spot here is that the DES now expects several thousand primary teachers to be needed in 1983 instead of the earlier prediction of only 69 vacancies.

40% of the total students in higher education is now women. But it is still more difficult for women to get jobs. Perhaps it is because the men are doing the recruiting; some would say that could be an advantage to a woman, but it does not always work out like that. I think the most difficult student I have to deal with is the quiet, non-numerate, arts, man or woman, without motivation for any particular type of work.

This year, things are so much tougher so that even the reasonable graduate is in trouble. And by the reasonable graduate I mean somebody who has actually benefited from the university education that has been presented to him or her. A person who has not only studied and got the degree, but has actually done something useful in his or her leisure time and has an application form which looks interesting. Even a number of those are having difficulty these days. We all know that the employer does not look at the course you have been doing, the employer looks at what you have done outside the course.

We have been having a worrying trend at my university which I hope is not mirrored elsewhere. Our students are dividing into two groups; one group is dead keen, looking for jobs and putting in applications for interviews at very frequent intervals, the other consists of those who do not bother, but get a degree and then claim social security for a while.

I would now like to consider the main differences between my sort of work and the work of a careers officer. I work in one institution and I do not move from there except when I go on visits to meet employers or to attend conferences. I am paid by that institution, I am responsible to the head of the institution. My office is where I do my interviewing. I have a careers' information room – a careers library – on the premises with full-time professional supervision. The staff/student ratio in my place is one adviser to 220 final year students and 220 second years as well, because we see second years during each session. All four of us work in a row of offices along the same corridor with the careers library at the end. I have a budget which, I suspect, even in the present circumstances, is less tight than that of most principal careers officers. The service is voluntary – we invite the students individually to see us – about 85% of them come – that is up to them.

The big difference between my work and the work of a careers officer is that my work is much more national than yours is, because the people you deal with are generally from the locality and when they leave the course they are going to remain there.

Of the 800 graduates on a degree course at Aberystwyth, 790 of them disappear to other parts of the country. What sort of jobs do they get? What sort of courses do they do? Well, it is very wide. If I have a history student who comes in to the second year who does not want to teach, you only have to look right across the board. I have a yellow sheet showing, for example, teaching, social service, the public sector, industry, commerce, and others, ending up with the church.

We look right across the spectrum of employment and courses and we must have information on courses all over the country. One day I might find myself talking to students about a civil service post in Whitehall, marketing with ICI, voluntary work in Bradford, or being a tourist guide in the Galapagos Island. These are examples of jobs filled by our graduates in the recent past.

The information in the careers library is only useful to the students if they are there and, of course, in the holidays they are not there. So many of our clients are scattered around the country. They can correspond with us, but it is very difficult to give any sensible careers guidance to someone by letter. You really need interchange. I feel there must be a very good information set-up, but it is also necessary to have the one-to-one exchange of information and opinion. We have currently got the problem now of graduates dispersed around the country, many of whom lack motivation. So what do we do about them? We are in touch by letter with a number of them, but only if they contact us first.

Your facilities are aimed at the local people for the local jobs. They come to see you. We have a system called mutual aid in which we refer them to the local university or polytechnic careers service. Then they can go along and use the careers information room and have personal consultations with the advisers.

I think it is going to be strained this year because places like Manchester, Birmingham and Leeds will have many graduates living nearby going and using their services, some of them from places like mine. By contrast, I will not have many unless they happen to be there on holiday.

We have been pushing graduates' self-employment recently. I was hearing only a few days ago about a graduate window-cleaner who is building up a very good business for himself. One of my former students called Kitty Little is now running a business with about £100,000 a year turnover in herbal preparations and beauty care. She started from scratch having an MA in American Studies, and she's doing very well!

Most of our information is hard copy, as yours is. We are not using computers very much yet. There has been an attempt to use Prestel, but so far it is very limited. But, of course, the graduates have all gone down now, so they have not got the same access to the services.

The vacancies are not updated as frequently and as immediately as they should be. We use Gradscope and Cascaid which are systems to enable the students to test out what they might be suitable for. These two systems are very good at encouraging the students to do some self-assessment which is, after all, our major objective.

Should there be more contact between careers officers in local authority and careers teachers in schools and careers advisers in higher education? I think there should. I go along to schools and have three sessions with the upper sixth on the relevance of degree subject choice to future employment. I do demonstration interviews with them using a couple of the sixth-formers as guinea pigs, and I do a session on making the most of higher education – getting in, settling down, and getting involved, which I think helps. Perhaps there should be more people involved in careers education programmes in schools. It is extra work for us, but we can fit it in and perhaps we ought to be pushed into more of it.

The Impact of Computers on Careers Education and Guidance Provision

Chairwoman: Pat White

Principal Careers Officer, Inner London Education Authority

One of the underlying themes of the conference was the impact of information technology which will be felt throughout society and the economy. Therefore, it seems appropriate to consider the business of careers education and advice as a suitable case study. In the previous sessions on 'The Future Development of Careers Guidance Services', Kevin Devine highlighted some of the apparently intractable problems facing the service and hinted that computers may be utilised to provide some of the answers. Much effort has been devoted to the development of computer-based systems to extend and improve the quality of the service provided. Three different systems are described and discussed.

The interactive careers guidance system (ICGS) – Alun Butler
JIIG-CAL – Jim Closs
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ICGS – The interactive careers guidance system

Alun Butler, *Principal Careers Officer, Bedfordshire County Council*

Introduction

In an introductory paper to the annual survey of the National Electronics Council for 1980/81, the Duke of Kent writes about survival by adaptation. "Many species of animals everywhere have been forced, either by their environment or by their enemies, to adapt themselves to their surroundings. Nature is full of examples of creatures that would have long ceased to exist had they failed to change their habits. Human organisms, too, need to adapt to changing circumstances. The whole of the industrialised world is today in the grip of a revolution as far reaching as any since the age of steam: that of electronics. We are entering the age where information technology – the convergence of computing and communications – may profoundly affect our industry and economy and, ultimately, the lives of all of us".

At the ICO Conference in Oxford last year, Professor Tom Stonier left his audience with a memorable sentence. "An educated workforce will master the new technology, an uneducated workforce will be mastered by the new technology." As guidance practitioners we should recognise the contribution computers can make to our work, and harness their potential. The alternative is for guidance to be devalued and the practitioner reduced to the level of machine minder in a computer-orientated rather than client-centred approach to guidance.

Change is here to stay, and young people leaving the education sector today will need to adapt, adjust, and manage change if they are to survive. Many young people will have little or no choice. The majority can expect to change jobs frequently in a working lifetime. Change is not always predictable, nor for the better. Jobs will disappear, and new ones will be created. Firms will go out of business: workmates will be made redundant, and supervisors will not always understand young people's problems. The real need is to be able to manage change that goes wrong – ie adverse change.

Clearly guidance has developed to meet changing circumstances. It is no longer concerned simply with matching abilities or aptitudes. It aims now to prepare youngsters to cope with an uncertain world of work, to develop understanding, to make decisions and to take responsibility for those decisions. The emphasis is upon helping students to ask the right questions, not the adviser giving the right answers: on process, not content.

Most guidance personnel agree on the problems facing them. They have too much information to handle, and too few resources. Computers provide a resource which can help with these problems, yet like some latter day Luddites, many careers teachers and careers officers have rejected the advent of the new technology. Resistance to computers was understandable when guidance was mechanistic, and computers were used in an essentially impersonal mechanistic way. It is less understandable today when guidance services are accepted by many as an agency for change – both for individuals and society. In view of the implications of microelectronics for patterns of employment, it seems appropriate for us to use the technology – "the medium carries a message."

The Problem

Guidance is labour intensive. Indeed the growth of careers education within the curriculum can be seen in part as reflecting the recognition that it would never be possible to cater adequately for the essentially personal and individual nature of career decision making. The computer potentially provides a solution to this problem: a medium which can cater for some individual needs, not only more quickly and more accurately, but also more economically than a counsellor. My own view is that to make the interactive use of the computer dependent on the counsellor, would probably price computers out of the guidance market.

Some development work has taken place – the systems most extensively used are CASCAID and JIIG-CAL. IGCS has failed to take off, because it is designed for on-line use, and is expensive to operate. Yet interactive usage is essential if such technology is to be used for learning purposes, as distinct from data retrieval and data processing.

The computer has the capability to store and retrieve vast quantities of data. It can bring together and relate numerous items of information. It can repeat the same process in the same way with patience and accuracy. The adviser's role is not simply to disseminate information, but to understand the world of work and its relation to individual goals and aspirations, and in particular to communicate effectively with the student in those terms. His role is to help the student appreciate the importance of information and to assist in the making and carrying out of plans. The adviser is a guide to implementation not simply exploration. Careers officers, careers teachers, practitioners do not always appreciate that information can hurt as well as heal. The adviser must respond to the feelings of his client towards information. His role is to listen and to ask probing questions, to interpret, to evaluate and to suggest more information seeking. If he can do this the adviser will be more effective: the computer will help with the more routine aspects of information, and people will matter more not less. The advent of new technology will follow the same principles in guidance service as elsewhere.

Where the outcome is predictable it will be computerised. When judgement is required people will continue to matter most.

ICGS

In designing ICGS there was never any suggestion that the computer would replace the adviser, but rather to help in three main ways:

> to relieve the adviser of non-counselling duties
>
> to help students with the process and content of career choice, by the use of case studies, decision making exercises, and as a stimulus in group discussion, in order to help students gain more control over their own lives by developing an understanding of the world of work and an awareness of how it affects their lives
>
> to serve as a valuable counselling aid.

ICGS was developed from a counselling and careers education approach to guidance. It is not a substitute for, but is heavily dependent upon a careers education programme within a school. It aims to stimulate a critical approach to occupational information and encourages decision making from a consideration of short and long term consequences of decisions.

Exploration of the system is carried out at a visual display unit by means of a light pen and an optional printer. To realise its aims, ICGS performs several tasks under student or adviser control. It can add, change or delete student information and subsequently display reports containing this information, or summarise the students' activity with the system. From the occupational data base it can display detailed information about individual occupations, or a comparison of two occupations side by side. And by combining both student and occupational information, it can list those occupations which have characteristics similar to specified parts of the student information, or compare data on student information with a specified occupation side by side.

The Occupational Data Base

The occupational data base was designed to cover occupations that secondary school pupils are likely to enter within 10 years of completing their full-time education, and cater for as wide an ability range as possible. 297 jobs were identified. An attempt was made to obtain information on the psycho-social aspects of work – ie the social surroundings within which work is done, and the human characteristics of the workers.

The Student Profile

ICGS allows the student to decide what information is fed into the computer, and how much. No other information is put in by the school: the student decides when to change or remove information about himself. The profile which a student builds about himself has several sections covering both cognitive and affective information. The student may keep two profiles current during a session: the base profile gives an accurate snapshot, whereas the exploration profile allows him to consider what he might be in the future.

Recommendations

> The major problem area in careers guidance is that of information. A computer is an information-processing machine. Any assistance to the adviser or student in this aspect is better than none at all.
>
> If the traditional matching model of guidance is being used, a batch system can effectively carry out the information-retrieval of occupational information and, if provision is made to enter and store student profiles, there may be capability for matching students and occupations on a limited, one-off basis.
>
> However if the emerging careers education model is being followed, an interactive approach which helps students study the consequences of decisions and develops their decision-making skills will be consistent with the emphasis on the ever changing individual and the ever changing world of work.
>
> The introduction of batch support to an interactive, developmental system can help more students get access to individualised careers education and counselling more quickly.
>
> For those students with a choice of either occupation or further education, the choice of post-school subject and institution is usually very wide. Inclusion of such data bases, especially containing information about a student's individual needs and values, is essential for a complete guidance tool.
>
> Even using computers, the major problem area is still that of information. The computer magnifies any gap in current knowledge.

> This gap is best handled on a national or consortium basis where resources can be co-ordinated to collect information over as wide a range as possible. However the computer does have a role to play in this whole area of currency and immediacy. The process of reassessing, updating, adding and deleting information should be as "infallible" as possible, easy-to-use and immediate in effect.

Many young people fail to cope satisfactorily with the transition from school to work. Faced with the experience of employment their values and the satisfactions they seek from work change. The need to help these young people re-adjust to the world of work raises implications for the development of a counselling service for the young worker. ICGS is potentially valuable to this group because it is client centred and extremely flexible. Equally it can be of value to the unemployed who need to develop a logical and rational approach to job choice. For young people and adults making vocational decisions, systems such as ICGS hold promise for improved guidance services. In the future, the use of microcomputers linked to mainframe computers will make computer aided learning systems more readily available, and contribute to the increased professionalism of guidance services.

JIIG-CAL

Jim Closs, *Lecturer, Occupational Psychology Department of Busines Studies, University of Edinburgh*

Introduction

Most of us believe that we have to keep the computer as an input into careers educational guidance in its proper perspective. In other words, it should be regarded as a tool. But there are tools and tools. A joiner who wants to put holes in wood, takes a hand-drill and drills the hole. With an electric drill – a new kind of tool – he can make those holes faster and more cheaply, but he is still doing the same thing; his job as a joiner has not actually changed. At the other extreme, a new tool can be a completely new technology. Word-processing and computer type-setting show the impact this can have on the newspaper industry.

At The Times, for example, a new technology is being introduced which is radically different from the technology being superseded. As a result there are very major changes in the nature of the job, the role of the operator and the relationship between the operator and other colleagues.

When we were designing the JIIG/CAL system we asked ourselves how we saw the computer being used in careers education. As a tool to be used and, if so, which kind of tool? We could have designed the system, for example, as a tool to help officers and teachers do what they currently do, but do it slightly better. That prompts the question of whether careers officers and teachers are doing what you think they should be doing or whether it is a satisfactory use of their particular manpower.

Now it seems to us that this is an attack on careers officers and teachers but, if one looks at the real need that pupils have, there are some big question-marks.

Many youngsters leave school rather ill-prepared for the experience of going into work. If you ask them at age 14 or 15 what they want to do after school, 80% will tell you they have a job in mind – Chef, Butcher, Secretary, Doctor, or Hairdresser. How much they know about the job is very questionable.

Ask them what they will do if they do not fulfil their ambition, which is what probably happens in most cases and the standard answer will be 'I don't know'. And they will remain in that 'do not know' stage until the last minute before they leave school. Then they suddenly realise, rather late in the day, that a crisis has crept up on them and so they begin to learn about careers.

Education officers and headmasters will tell you that we do have careers education programmes in schools. They vary quite considerably, from virtually nothing to, perhaps, one teacher who carries the careers role for the entire school, to teams.

Curricula for careers education vary from either none, to one so flexible that the careers teacher can decide for himself what that curriculum means. There is tremendous variety in what goes into careers education. Often career work is squeezed in at odd hours, when people can be taken away from more important things like studying for their exams. In schools we do not have adequate resources and schemes for preparing students for the point at which they leave school.

That brings us then to the careers service because, undoubtedly, the children need the careers officers to help them. We do have careers officers, but our resources are very limited especially if we try to assist all those children who need attention. We do blanket interviewing, which means that each pupil will be seeing the careers officer for about 20-30 minutes. That will be the sum total and the most significant input of careers education that they will have.

It is very much a case of crisis counselling at the eleventh hour. It is too little and it is too late. Kids really have got a lot to learn about jobs. Right now we have information on over 450 occupations, in our own job file. There are 700 separate pieces of careers literature reference available. Furthermore the youngsters have a lot to learn about themselves.

The JIIG/CAL project aims to begin a scheme of careers education, starting in the penultimate year of school, which will put pupils through a properly timetabled, and properly structured, careers education programme.

Consequently the project should make children aware of the need to think more seriously about employment, while they still have time enough to do so.

Origins

The JIIG/CAL system is a joint development by the Department of Business Studies, Edinburgh University, and the Educational Computer Centre, London

Borough of Havering. It is based on research and development at these two centres.

At Edinburgh the research has covered career guidance issues with a specific focus on occupational interests. An interest test – the APU Occupational Interests Guide – was the main result of this research and has been widely used by careers services throughout the United Kingdom since it was first published in 1969. It has also been used in Australia and New Zealand, and a French translation was published in 1972.

Havering has made a significant contribution to the field of computer assisted learning. Its CAL system, which is installed at various centres in this country, has a respected national and international reputation. It was recently adopted by the National Research Council of Canada, for use in that country.

JIIG/CAL is the product of the combined experience and expertise of these two research programmes.

Aims of the system

The system is intended to act as a resource for careers officers, teachers and others concerned with the careers education and guidance of young people. It aims first to provide both pupil and careers adviser with ideas, in the form of relevant job titles which can be explored as possible careers. Its second purpose is to supply information about each job in the form of a brief description of what it involves, together with details of any skills and/or qualifications required, plus notes on other relevant features. This is supplemented with references to related careers publications through which the pupil can find out more about each job for himself.

An educational tool

JIIG/CAL is an educational tool for use under normal classroom conditions. It is designed to fit easily into an ongoing careers education programme. Beginning in the second last year of normal schooling (Scottish S3, English 4th Year) pupils first learn how to use the system by themselves. From then until they leave school they may use it as frequently as they wish or as the school will permit. The system guides them towards jobs and job information relevant to themselves and helps them to make more effective use of the advice and information available to them. References to appropriate career publications are printed with each job and in this way pupils are helped to make effective use of a careers library. Intelligently used, the system enables the pupil to explore a range of career possibilities, identifying those which would be suitable and clarifying the features of jobs which are most important. In this way it encourages learning about jobs and facilitates a better preparation for the transition from school to work.

The role of the computer

Guidance is a time-consuming business. It involves making an objective assessment of the pupils' strengths and weaknesses, likes and dislikes, and helping them to be aware of their own limitations. Then they need information about jobs and advice on identifying the ones most likely to suit them. Often they need help in coming to terms with the discrepancy between what they want and what they are able to get.

In an ideal world, such help would come in the form of trained and sympathetic careers advisers who had adequate time to listen to their problems, discuss their ideas and give them a lot of personal attention. Unfortunately the teachers and careers officers who try to provide this help are already hard-pressed for time and resources. Few pupils will get more than half an hour to an hour of personal attention. Many will get substantially less. Of course it isn't enough! Because of this, many pupils and parents see the local authority provision of careers advice as inadequate, failing to meet their needs. Some go to private agencies where they can buy the kind of expertise and personal attention they feel they need. The going rate is around £60. Few parents can afford it. Nor can local authorities envisage a per capita increase in expenditure of this magnitude in order to upgrade their provision. With the help of the computer, however, a substantially improved service can be provided for less than 60 pence per pupil. Computers are cost-effective.

And its limitations

However, it is not only the economic considerations that make computer support attractive. There are many things which computers can do much quicker and much better than a human being. Their capacity to store large amounts of information and retrieve it rapidly, gives them a unique role in career guidance. No human careers adviser can keep in his memory all the details of qualifications requirement, training programmes, relevant courses and all the other facts about the hundreds of jobs available in modern society. To the computer, the task is very simple.

On the other hand, there are many things the computer can't do as well as a human being or can't do at all. It cannot provide the interest, understanding, sympathy, encouragement, advice and practical help which pupils need. There is no way in which it can act as a kind of robot careers adviser. What it can do is to take over the job of providing pupils with factual information, thereby freeing careers officers and teachers to spend more of their time on careers education, counselling and guidance, and giving pupils the personal attention they want and need.

Developing the system

The joint development work to produce the system began around 1976/77 and the first two and a half years were spent in planning. This involved drafting design specifications which were submitted to careers officers and teachers who gave comments, criticisms and advice based on their practical experience. During this formative period, their ideas helped to shape the system's development and much of its success is due to the ideas and suggestions which emerged during those planning discussions. After programming was completed, pilot trials were held to test every aspect of its functioning and to permit debugging of the programs. By Easter 1980, the system was finished and ready for release.

JIIG/CAL is not just a computer program. It is the most comprehensive and sophisticated system of its kind available in the United Kingdom at present. The components consist of:

> The Computer Software – this comprises 15 main programs plus a library of sub-programs consisting of three machine dependent routines, two machine dependent functions and over 25 sub-routines. All are in ANSI Fortran X39.1966.
>
> The Jobfile – this is not a vacancy file but contains coded and descriptive information on 440 occupations, which cover around 90% of the most common jobs.
>
> The Occupational Interests Guide – this is an interest test based on the APU Occupational Interests Guide. The JIIG/CAL is unisex and covers all levels of ability.
>
> Classroom Aids – a Handbook is available which explains in detail all of the procedures to be followed in administering the system in schools. This is supplemented by a set of visual aids. Notes which help to explain the system printouts to pupils and their parents are also provided.
>
> Trainer's Pack – the Manual is the main reference book for system users and also forms the basis for in-service training programs on its use. A set of 120 originals from which OHP slides can be produced also forms part of the Pack, together with notes on the use of the slides and the general organisation and running of courses.
>
> Ancillary Aids – these cover manuals to aid with the installation and operation of the programs, documentation for use in reporting faults, computer stationery, posters and publicity materials. There is no fixed method of using the system. We do give guidelines on how it can be used effectively, but it is intended that a fair degree of flexibility in its use should be possible. The components act as resources which may be used either in one-to-one career guidance or as an integral part of an ongoing careers education programme.

How it works

Figure 1 gives an overview of the main stages involved in the operation of the system, as used in careers education. Six of these take place in the classroom and two at the computer centre. A rough indication of the length of each classroom session is given and these are fairly realistic minimum times. The nature of the activities to be carried out at each stage and the sequence of stages cannot be altered. The duration of the stages and the intervals between them are, however, at the discretion of those administering the system.

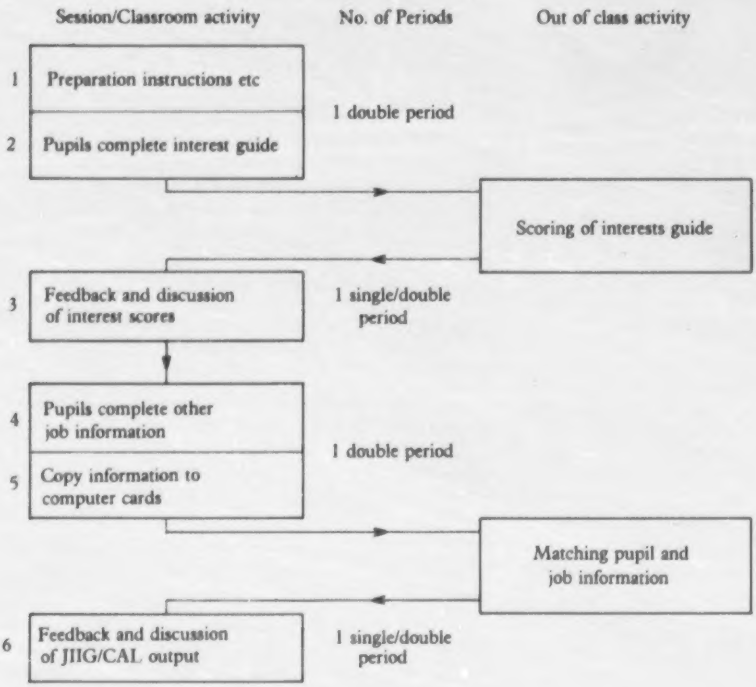

Fig 1 **Overview**

Session/Classroom activity
No. of Periods
Out of class activity
1
Preparation instructions etc
2
Pupils complete interest guide
1 double period
Scoring of interests guide
3
Feedback and discussion of interest scores
1 single/double period
4
Pupils complete other job information
5
Copy information to computer cards
1 double period
Matching pupil and job information
6
Feedback and discussion of JIIG/CAL output
1 single/double period

Technical Information

Language

The system is written in a subset of Fortran X39.1966

Program sizes

The suite consists of 15 main programs, plus a library of subroutines, amounting to approximately 15,000 lines of Fortran code. The largest single program will run in less than

74K Bytes of store. This figure is dependent upon local implementation factors such as the efficiency and compactness of the code generated by the Fortran compiler.

The programs can be segmented to run on small machines.

Portability

The system is easily transferable between machines. It is written in two sections, of which one is machine independent. The second is a small section containing the machine dependent elements. These handle disk input and output, and provide parameters for the whole suite which describe such characteristics of the host machine as its Word Length, Sector Size, and the input and output channels being used.

Users will be able to do their own implementation, modifying the machine dependent section to meet their own requirements. This is not a major item and although the workload will vary from site to site, a few man-days for an experienced programmer is all that is normally needed.

Machine Range

The system currently runs at Havering on a Hewlett Packard HP21MX/E under RTE4-B. At Edinburgh it is also running on an Interdata 7/32, and on an ICL 2980. Versions have also been implemented on IBM 3053 and 370 systems. Other machines where work is in hand for implementation include IBM 4330 and PRIME 400.

File Handling

The file sizes required for any particular implementation depend on the characteristics of the host machine and the amount of space locally used for the optional features of the system. However, 1.2 Megabytes is seen as being a realistic minimum.

Input Medium

This can be keypunched on paper tape, 80-column cards or key-to-disk, or can use a range of mark sense card or page readers.

Output

This can be arranged to suit the local requirements but normally will use plain single and two-part-line-printer stationery, with a line width of 80 characters.

Manuals and Support

An Installation Manual is available for analysts studying the strategy for local installation, and the system comes with a comprehensive Operations Manual. Technical support during the period of installation will be provided.

Micro Computers

The system, as it stands, is too large and too powerful to run in its complete form on micro-computers such as the Apple and Research Machines 380Z. Nevertheless, work is in hand to produce a *subset* of the system's facilities for use on micros, to provide some local processing in schools and careers offices. It should be stressed, however, that the micro version will *complement* rather than replace the mainframe version. It is, therefore, emphasised that micro-computer installations will require the support of a full mainframe implementation of the system.

JIIG/CAL currently runs in Batch mode but an Interactive extension is planned for implementation at a future date.

CASCAID

David Pollard

Head of CASCAID Unit, Leicestershire County Council

CASCAID is an aid to careers officers in their task of giving vocational guidance. The system derives its rationale from interviews where the adviser needs to compare a mass of employment and educational information with the interests and abilities of the client in order to make suggestions of suitable careers. CASCAID was the first such system in the UK. It was developed in 1969 by two careers officers working in Leicestershire, Joe Witherspoon and Clive Roberts. In 1978 CASCAID was offered nationally to all LEA Careers Services.

Information is collected about the student by means of a questionnaire called a 'Student Data Form' and is compared with over 400 careers titles in the 'Careers File'

First of all the student provides information on examination results (possible and actual). Then a 'print-out' can be requested with the range of careers which are available. This approach can be used to provide guidance on the careers implications of different combinations of 'A'-level subjects.

The student's choice is narrowed down further by relating the answers to a series of questions designed to elucidate the student's interests and attitude. The student is asked to respond by using a five-point scale from Like Very Much to Dislike Very Much on aspects including for example:

"Work involving a knowledge of chemistry"

"Using a sense of colour, shape and design"

"Understanding the properties of natural and synthetic materials"

"Helping others with their personal social problems"

"The care and treatment of animals"

Students are also asked to indicate any disability which could affect career choice and to state current career plans.

The system contains details of over 400 career titles which are continually being up-dated in the light of experience and in response to changing occupational opportunities. The student's responses are then compared with the profiles of all the careers titles in the careers files. The system will then list those career titles with a good profile/response match.

If there are less than 12 of these, it will go on searching to produce career titles with a fair match. The titles are ranked, the career having the best match heading the list and a minimum of 12 titles appear, whatever the response/profile of the student may be. Against each career title printed there is the career title analysis (in terms of the questions posed on the student data form), together with the student's responses to that analysis. Thus it is clear to both the careers officer and the student why such a title has appeared.

The main use of CASCAID is with first year 'A' level students. For the 15 or 16 year old, comparative print-outs allow implications of various options to be spelled out eg. 'A' level subject choice or whether to stay on for 'A' levels or leave school.

CASCAID must be used within counselling. When it is introduced into the careers interview is up to the individual careers officer. It is important that the careers officer has established a good rapport and has a good understanding of his client prior to the introduction of the computer print-out. The student data form itself may highlight some points to aid the careers officer in these initial discussions. The print-out should come at the point when he is ready to introduce new careers ideas to his client. The careers officer will need to use his own knowledge and experience in interpreting the career suggestion made by the system. The kind of additional information that can be needed includes:

> the aptitudes, skills and personalities needed to be successful within each career
>
> difference between the normal qualifications needed in order to have a good chance of entry and the statutory minimum entry qualifications stated by professional or educational bodies
>
> the alternative routes for entering careers
>
> availability of opportunities for entry and progress

Presently the search for career suggestions can be a hit-and-miss affair. CASCAID improves the professionalism of the adviser and can perform this information handling task more effectively, leaving the adviser to concentrate on the more subjective and intuitive tasks.

The Impact of New Technology on Work Itself

Chairman: Colin Marsh

Careers Adviser, Institute of Personnel Management, London

This session considered the direct effect of information technology on existing work practices, the problems created by the changes resulting from the introduction of information technology and some of the efforts being made to cope with them.

Bernard Bowler highlighted some of the factors which he believed are becoming important. These include:

- scope of work is likely to be more wide-ranging than at present
- work is likely to be less demanding physically
- a much more flexible approach in attitude to work will be necessary
- a less inhibited approach to new ideas and applications will be required

Stanley Bateman described in detail a study done by the O & M Unit of the Northern Universities on the introduction of word-processors. The Unit concluded that on the whole, once the initial difficulties and fears were overcome, staff found their work was more interesting and satisfying. Authors found that the quality of the service provided was much improved. He then went on to describe in detail the negotiations between management and union at the University of Bradford on the introduction of word-processors.

Mike Greenwood works for an organisation which has changed from a system of manual record keeping to one based on computers in a relatively short time. He explained how as a result there have been some significant changes for workers at all levels. Examples include:

- school leavers beginning work as a clerk or secretary have to cope with equipment which is significantly different from anything experienced in school
- managers and supervisors have to learn to use and evaluate the potential of the new technology. This is in addition to their traditional function and makes their job more demanding
- executives now have a much better quality of information available, which is readily accessible, on which to base decisions.

Changes in Work Practice

Bernard Bowler, *Practical Personnel Management Consultant*

I see three significant, if non-revolutionary, changes which have been taking place:

> Improved as well as new technology has increased the speed, size and cost of many production machines. At the same time the sheer pace and scope of change has meant that many firms have had to think about replacing these machines much sooner than before and capital

> recovery periods of 3 to 5 years are not uncommon compared with 10, 15 or 20 years, a decade or two ago. This demands high and effective utilisation, ie. continuous shifts, effective work practices and low manning levels.
>
> At the same time, new technology has brought advanced pre-production techniques within the reach of many medium and smaller firms where before they used outside trade specialists. But the new equipment, although cost beneficial is, nevertheless, so fast that no firm of their size can use all its production, so the operative uses it for only a few hours each week and for the rest does other things. In other words, he/she can have two or more 'part-time' occupations at the same time for the same employer.
>
> Distributed data processing and direct data entry have led to operations, previously the preserve of 'the office', moving out onto the factory or warehouse floor and being carried out, via the visual display terminal, by existing operatives as part of their normal daily work as (for example) mail order warehouse order pickers, stockmen and machinists – in steel mills, furniture factories, etc.

These factors have already brought about changes which are probably more widespread than many non-industrialists realise, although of course, there is still much scope and they will continue to spread.

The office itself, in the smaller firms, is now frequently computerised and I can think of several industrial firms employing less than two dozen within a few miles of us today, where the office staff use the computer and word-processor as a matter of course – not that there is anything remarkable in what they are doing, simply that they are doing it in traditional industries where it might not be expected.

For years there has been talk of new entrants to the job market having to undergo three or more cycles of re-training during their life-time, and now it is beginning to be a reality and not *just* because of new technology. Life goes on and there are changes in the law, society and the economy. All affect work itself and the attitudes to it.

Here are some of the ways in which I believe the changes will be manifest:

> scope of work done by any one person is likely to be wide-ranging – ie. responsible for more than one occupation, as envisaged at present
>
> generally less physically demanding
>
> may be more demanding mentally but still relatively repetitive (as opposed to mindless repetition)
>
> demands flexible approach to shift and unsocial hours
>
> demands flexible approach to range of tasks people are prepared to perform

demands flexible approach to purpose/goal/identity in industry and society

demands conceptual approach to work training and re-training

demands a less inhibited approach to new ideas and applications

demands open and consultative approach to change by employers so as to avoid fear of the unknown by their employees

On top of all these there is likely to be a reduction in the demand for human effort in the formal economy and in essence this will mean work-sharing.

My experience is that demands for a shorter working *year* are now more genuine than ever before. People are becoming more constructive with their leisure and, therefore, want more of it. There is some doubt that everybody would want or could cope with sabbatical years. Trade unions represent a significant influence and they are not always as restrictive as their image might suggest. The unions are giving serious attention to new technology and its implications. As a result, many ordinary people are obtaining knowledge and understanding of the technology and its potential social implications.

When we also realise that today's school children are rapidly developing the ability to handle far-reaching concepts, and there are grounds for believing that we can make the information society work – but I fear for the under achiever. The scope for simple, repetitive work, physical or clerical is certainly diminishing. Small businesses may well create new employment opportunities, especially if they foster simple crafts.

In the short term, I fear there will be a trough, when sufficient new technology has been introduced to cause a reduction in jobs, but ultimately there are likely to be new employment opportunities *which are at present unknown.*

Coping with Word Processors

Stanley Bateman, *Personnel Officer, University of Bradford*

I will talk about Trade Union and Staff response to the introduction of new technology, illustrating this with recent experience in universities generally and a brief case history drawn from my own experience with NALGO on the introduction of word processors. This University is the 3rd largest employer of labour in Bradford responsible for the employment of 2,000 staff, 350 of whom are clerical and secretarial. There are many and various types of offices which could justify the use of word-processors.

Bradford, in association with several other Northern universities, contributes to the funding of an Organisation and Methods Unit which provides a service for its members. Last year they carried out a survey to study the impact of word-processors which had already been introduced. They reported that the secretarial and clerical staff had found the first two months to be a difficult learning period, the equipment was confusing and progress was slow. Much encouragement was needed initially before confidence was built up and effective work performed. However, after six months of using word processors, most staff would not want to be without one. Age of staff was not a factor in determining acceptance or rejection of new equipment; staff found their work more interesting and more satisfying. Response from Academic staff using the results of word-processors was enthusiastic; less checking of work; higher quality of finished work; quicker turn-round of work.

There was no concern by staff on the health and safety issue as touch-typing avoids continuous looking at screen. The O & M inspectors investigated union attitudes in universities to the introduction of word-processors and found that, through contacts with NALGO and the unions involved in the North East region, they had the traditional two concerns:

redundancy

health hazards with VDUs

There are agreements on both points, but the O & M Unit concluded that on the evidence to date there were no worries about word-processing. Worries which did exist were shown to be unfounded.

I will now deal with the general trade union strategy on the introduction of word-processors. A typical response from the recent APEX report indicates that the first priority of trade unions is to protect jobs. Therefore, the initial response is to consider work-sharing through various ploys such as reduction in overtime; shorter working week; longer holidays; early retirement; paid educational leave. Subsequently they may discuss output bargaining which means increased output rather than job loss. As a last resort unions will be prepared to consider job reduction, although they may attempt to persuade employers to provide earnings guarantees, which last as long as the worker is unemployed. The APEX report was, in general, fairly positive and willing to give practical advice on health and safety issues.

Now, I want to discuss the particular agreement which this University is trying to reach with NALGO on a code of practice for the introduction of new technology. NALGO, in particular, seems to be concerned about the introduction of word-processors and has put policy statements out to their branches indicating the agreements required from management. We are making progress in reaching an agreement. We will not introduce further word-processors into the University until this agreement is finalised. The features in the agreement which we are currently negotiating with NALGO are:

> that we will apply the agreed procedures where office equipment involving micro-technology affects the job content of staff or the organisational structure or working practices, with the aims of improving efficiency, increasing job satisfaction, and improving working conditions

we will agree to consult with the trade union prior to major changes in methods and equipment

we will inform the trade union of reasons for introducing change, and will include in discussion terms of introduction of particular machines in particular areas

in the case of any dispute, status quo will prevail until disputes procedures have been exhausted

the main subject of joint consultation will be the effect on staffing levels, and we will undertake to minimise possible displacement of staff and compulsory redundancies

personal protection of grading, conditions of service on those members of staff who may be adversely affected

staff will be allowed time to familiarise themselves with new equipment and organise monitoring of working arrangements

we will make redeployment available to those who are not able or are unwilling to acquire the necessary skills

In 1977 the local Bradford Council agreed with NALGO that word-processors should be introduced, in which a central office was set up with 10-12 operators continuously working on word-processors as a replacement for departmental secretaries. There was a reduction of about 50% in jobs. As we deal with the same union, clearly it is very much aware of what happened in the Council.

One point that will be contentious and which we will have difficulty in persuading the union to accept, is we would wish requests for regrading of posts which are affected by the introduction of new technology to be processed through the usual procedures for posts whose job content has changed significantly. On the other hand, NALGO would not be prepared to accept the introduction of new equipment until the rate for the job has been agreed. In their view this would be a new and fair rate for the job. There are different views as to whether word-processors require more or less skill over a period of time and whether job-regrading should automatically follow. Our experience and feeling is that an increased rate would not be justified automatically and there will be some hard bargaining on this particular point. Other features will be concerned with training, re-training and redeployment of staff. There will be a commitment on our part to train staff so that they can reach the required level of proficiency. We will provide re-training for displaced staff and will discuss the content of training programmes with the trade union. We will endeavour to provide as wide a choice of alternative employment as possible for any staff who are displaced. We will also have proper regard for health and safety for staff who are affected by the introduction of new technology. We have already arranged through our Optics Department to meet the cost of any eye tests which are needed. We will monitor the health of staff who are operating the equipment and will, if necessary, consider questions of rest periods for continuous operation. The final part of the agreement is that both parties will agree to follow the guidelines, that it will be open to review at any time by either party and that in view of the commitments and safeguards which the University is making, the staff are expected to facilitate the introduction of new technology.

Let me finish with a few quotes from the APEX report: They believe that jobs are at risk from the introduction of word-processing technology, but that more jobs are at risk from a refusal to use it. For the office worker new technology could mean a working life which is better, more skilled, more satisfying, shorter and less arduous.

Adjusting to Computerised Systems

Mike Greenwood, *Personnel Training Officer,*
Bradford & Bingley Building Society

I intend to look back over recent years to try and highlight changes in the nature of the work carried out within my present commercial environment, and by highlighting these changes try to predict changes in the nature of the work in the near future. It would need a much braver man than I am to hazard a prediction into the middle or even distant future. In under two decades my present organisation has moved from a manual record keeping, commercial enterprise, to a highly computerised (and computer dependent) national employer. The rapid rate of change has presented many problems for those who have been instrumental in introducing the changes, whilst maintaining efficiency and the ability to compete. I would now like to examine how the solving of these problems has imposed necessary changes in the nature of the work of all employees within the organisation, from those at the school leaver, first job holder level, to the policy formulating chief executive level.

At the Introductory Level

Twenty years ago there was very little difference in the mechanics of doing a clerical job whether you worked for a small solicitor's practice or an international financial organisation. With the advent of new technology the tools of the trade used in the large financial institutions have moved rapidly away from those in smaller business units.

In the past, a typewriter was very much the same in all organisations. Now the secretary or typist moving from a small office environment to a large organisation such as mine, has to cope with a carriageless golf ball typewriter, at the least change level, to the most sophisticated word processing equipment with its multiple functions which must be absorbed by the operator to allow optimum operation, at the most change level.

The school leavers of two decades ago were not taxed too much to transfer traditional classroom skills, such as arithmetic calculations and business letter writing, from their school environment to the work situation. This is not the case today. School leavers have to put those basic skills to work but through complex dictation equipment, programmable desk top calculators, mini-computers or even a multi-million pound main frame computer, and unless the education they have received has been of the most progressive type the transfer of skills is not an easy one.

At the Managerial/Supervisory Level

Managers and supervisors have always considered themselves to be the 'thin meat in the sandwich', sandwiched between executive policy formulators at one side and the employees who must make those policies work at the other. I would suggest that the application of new technology has introduced a third dimension to the managerial sandwich. Managers and supervisors must now come to terms with the technological possibilities and how to get maximum benefit from systems and equipment far too complex for any but the specialists to comprehend fully. This has complicated the network of relations from executive-manager-subordinate to executive-manager-technology specialist-subordinate. Thus calling for a higher skill level from managers and supervisors.

One graphic example of this change has occurred as we have introduced computer terminals into our branch offices. We decided to train our managers in cashiering using the new terminals, allowing the managers of each office to train their own staff in the new procedures. This has required the manager to become familiar with the computer system and training techniques as well as coming to grips with basic cashiering again, perhaps after many years lapse. Not an easy exercise for a manager primarily concerned with the building society business.

At the Executive Level

The advent of new technology and its impact on the rate of change has brought two fundamental changes to executive policy formulation and decision making. Firstly, the number of fundamental changes in production and systems that it is necessary to include into a medium or long term strategy has increased dramatically. Strategic considerations in the past would include one or, at worst, two fundamental changes during a 5/10 year plan. It is now necessary to identify and provide for many more changes in the same period. Secondly, the amount and quality of business information available and the speed of access to that information has added a new dimension to the business of decision making.

Business decisions made with a limited amount of information and alternatives to consider are one thing and call for one level of executive expertise. Business decisions made with almost limitless information and the ability to consider almost endless alternatives are quite different, calling for a much higher level of executive ability. Hopefully, decisions made after considering the high volume of relevant information are better decisions, always assuming that the decision makers are equal to the more difficult task. This brings with it a higher level of accountability for incorrect decisions, since the excuse of insufficient information on which to base decisions is disappearing.

At the Specialist Level

This area is too wide to cover fully in the time available. Therefore, I would like to consider two aspects – the computer technologist and the personnel/training practitioner.

Firstly, the computer specialist. In the relatively short period during which we have used a computer as part of our business, we have seen two distinct trends emerge. One trend is the increasing value of trained and experienced data processing staff in terms relative to the cost of the hardware they utilise. Skills and experience are becoming more and more expensive whilst the cost of computing power is falling dramatically. The other is the initial desire to isolate the computer and its functions from the user behind many specialists such as systems analysts, programmers and operators, giving way to the desire to introduce 'end user computing' where the user of the information has more direct involvement and control over its creation. This reduces the number of specialists between user and the computer facility.

Secondly, the personnel and training practitioner. In my opinion personnel, and I include training as one aspect of personnel management, is concerned with the prediction of, identification of and adaption to change. We all accept that our working lives are changing faster than ever before, new working practices are having to be accepted and adopted, new skills acquired and applied. Personnel managers can no longer afford the luxury of responding to minor changes over a reasonable time scale. The future need is for rapid reaction to changes so large that they have not previously been contemplated. Personnel will have to change from being content with filling small gaps to concern itself with the bridging of chasms if we are to keep pace.

One area where we have been considering utilising new technology to help us bridge some of the gaps is in the area of interactive computer assisted training. At present we utilise our assistant managers as trainers, reasoning that these are the staff who are at the correct organisational level to give training with a true perspective. In common with most employers the employment cost of this particular type of employee has risen considerably over recent years. This has prompted us to look for a technique which can reduce the amount of time assistant managers have to spend in the training role. Perhaps their role will change from that of face to face trainer to that of tutor, utilising a computer based training programme.

Computer assisted training schemes offer us a standardised approach, with the added advantage of maintaining some level of interaction between trainer, in this case the computer, and the trainee. This also allows easier centralised monitoring of all trainees' progress.

What of the Future?

It is my opinion that we are passing from an era of de-skilled jobs or careers to the era of the wider scope job or career with the distinct probability of more than one fundamental change of career direction. The simple mechanistic/repetitive checking or entering/imputting jobs are disappearing in my industry to be replaced by larger, less tightly defined jobs. This brings with it two problems.

One is the problem of equipping the larger job holder to realise his or her full potential. Secondly, and perhaps the more difficult of the two problems, is what can be offered to the less flexible or able job holder as their jobs are being phased out or replaced.

I look forward to the future with eager anticipation in the certain knowledge that the new technology will place demands upon all of us but bring with it considerable rewards.

School to Work – What Choices?

Chairman: Michael Harrison

Chief Education Officer, Sheffield

representing the Society of Education Officers

In his presentation from the chair, Michael Harrison emphasised the crucial role of wealth creation and the importance of having a public education service which will support economic regeneration. But we must recognise that in future the predominant inputs into economic activity will be information and knowledge rather than capital and labour, which were characteristic of the industrial era.

Consequently attitudes, values, employment will be very different from those at present. It is essential that the education service, including careers advice, recognises those fundamental shifts and takes account of them in its work.

Julian Harrison emphasised that the information technology industry is characterised by short product life-cycles and that the labour market is constantly changing. Careers patterns are therefore very much more volatile than in other more traditional industries. Education will have to encourage the development of self-confidence and meta-skills which provide an individual with the ability to cope with rapidly changing circumstances. Some examples identified include:

ability to recognise new opportunities

ability to sell yourself and your skills effectively

breadth of knowledge and interests – convergent rather than divergent thinking

Michael Trollope discussed some of the problems encountered by the education service as an increasing proportion of children stay on at school after 16.

Not in front of the children

Michael Harrison

The Society of Education Officers, representing all the administrators of public education in England and Wales, recently set up an industry/education committee on micro-electronics. Its brief was to consider the possible shortage of computer-qualified manpower identified by NEDO (1980).

Although views differ on the subject, it is clear the country is desperately short of people qualified in the new technology, and the new complex of technologies – especially in what we popularly call the technician area.

The prime objective for the Society of Education Officers in the next few years is to see how the public education service at all levels, from primary to maintained higher education, can support the economic regeneration of this country without which everything else we want to talk about is worthless.

But it will not happen because we do not have the money. In Bradford education is being cut because the country has not earned enough money to maintain the higher education system that it would like to have. Senior management systems in local authorities know this only too well, as they have been coping with shrinking budgets since the introduction of the International Monetary Fund measures when education capital programmes were cut and have never been restored.

I think there is a very serious and positive job to be done in public education and I was a little non-plussed to hear of a possible return to that Ruskinian wish to evade the harshnesses of the realities of life, and to disappear into an electronic cottage, with electronic roses round the door, pursuing some detached electronic peasant economy. In Japan, information technology is used with a sternness of purpose and commercial drive as the fourth resource to make that nation rich and powerful.

It will sound harsh to the young unemployed at the moment, but the only salvation for them is for us to turn the system over in such a way that we can become economically effective enough to fund the redeployment of labour.

In Sheffield, politicians realise the dangers of the possibility of a collapse of the major industry – steel – and we are moving to a 16 to 19 tertiary coordinated system which will help to take the worst of the sting out of youth unemployment by setting up traineeships. That in itself will have much to offer to the solution of the curriculum and examination problems.

There is no way of meeting the university dominated examination system head-on to change it. It will have to be out-flanked and the 16 to 19 tertiary approach will outflank it, especially if Manchester, Birmingham, Sheffield, Liverpool, Newcastle and Bradford, original industrial centres of this country team together and run education their own way and as a result make examination boards change their ways.

I entitled my talk 'Not in front of the children' because it has occurred to me several times recently that we, allegedly the elders and betters of the younger generation, do not really have a clue when we talk about their future.

Ten or fifteen years ago it may have been true that we had a fair idea of the sort of careers they could propel themselves into, and therefore the educational career choices were reasonably clearly-defined.

American research suggests people make up their minds about the way they want to go in life when they are about eight years old. If it was true in the past, I do not believe it is true any longer. If I had to choose one word to illustrate my thesis it would be discontinuity. Daniel Bell in his book 'The Coming of the Post-Industrial Society', published in 1973, says in a new foreword "Theoretically one can say that post-industrial society is in principle different from the other two" (by which he means the industrial and the agrarian). "As a theoretical principle, the idea of industrialism did not derive from an agrarian mode, and similarly the strategic role of theoretical knowledge is the new basis of technological innovation. For the role of information in recreating social processes does not derive from the role of energy in creating a manufacturing or fabricating society".

Broadly speaking, if industrial society is based on machine technology, post-industrial society is shaped by an intellectual technology, and if capital and labour are the major structural features of industrial society, information and knowledge are those of the post-industrial society.

He goes on: "For this reason the social organisation of a post-industrial sector is vastly different from an industrial sector and one can see this by contrasting the economic features of the two.

"The economics of information is not the same character as the economics of goods, and the social relations created by the new networks of information from an interactive research group communicating through computer terminals to the large cultural homogenisation created by a national television system are not the older social patterns for work relations of industrial society. We have here, if this kind of society develops, the foundations of a vastly different kind of social structure than we have previously known."

If he is right, then the sort of world we are looking forward to in the future is going to be so different from the world we were brought up in that maybe we are not competent to approach the subject.

If that sort of counselling infrastructure with social values, assumptions, hierarchies, family and school relationships has ceased to be of the value it was before, what happens then to the relationship between the adviser and the advisee?

Is the person to be advised – if he or she has a gut feeling about what is going on in the world, and most young people do – are they going to be willing to listen to anybody of older generations? We all need a great deal of tuition. The new technologies and their 'jargon' have been with us, in a sense, for 10 years, if not for 100 years. New technology is not really something that has just appeared over the horizon. It is a re-emphasising and a reinforcing of previous tendencies, and that is already happening and the Americans, Japanese and others, are far further along the road than we are.

Reference
National Economic Development Office (1980) Computer Manpower in the '80s. The supply and demand for Computer related manpower to 1985. HMSO.

Working in Information Technology

Julian Harrison, *Lloyd Chapman Associates*

I work in the information technology market place at all levels, and I am going specifically to interest you in how to help people in the 16 to 19 age group to look at the future and to develop personal meta-skills.

What I want to talk about first is the new nature and volatility of the information technology market place. Then I will illustrate why it is different from the industrial society's market place, and what that means for young people who must look forward towards helping themselves in what is a very unstructured labour market.

I want to highlight some of the major changes from the life cycle of solid products, with a dependent job market place, to an information technology market place.

For instance one original product, say a steam engine, generates a fair amount of revenue against time outside of direct profits. People become dependent on the product over a period of time – the makers, sellers, distributors, maintainers, and others who make money out of it.

In the technology market place, the life cycle is much shorter because the essence of it is intelligence – where the 'entrepreneurs' now see ways of improving the product. The payback time period is very short, the labour market more volatile.

The implications are that the overall market place consists of this succession of such products, and to guarantee a continuity of employment and a career path in that style of market place, someone who wants a career in information and technology has got to be able to maintain his position. He cannot do that if he is blinkered and dependent on product 'A' as a coalminer could expect to be for the whole of his life. Coalmining evolves in a very gentle way, software products do not. So how do we help the 16 to 19 age group plan for a career in information technology? Perhaps the only way is to develop meta-skills in the way they deploy their personal activity over their working life.

There are three main strands to it. One of the by-products of this style of market place is that it lends itself very much to small firms. In Britain at the moment, the average size of computer services sector which sells, services and maintains software, is 65 people in a firm. Now that is not very big at all, by comparison with industrial undertakings. It also means that barriers to entry into the market place are very low, so it is easy to start a software house. You just need some bright lads who are prepared to work for a song for a couple of months and bang you are on the road. The result is that there is a very cellular nature to the market place and the career development of people in the market place does not mean spending your life climbing promotional ladders.

In the information technology market place you hop from cell to cell. The mechanism is largely commercial because the people who run these things are very close to the thinkers and the men with the money and the resources, and the decision makers are very close to the doers. So the hiring and firing of people in this market place is done by commercially minded people, and one of the great meta-skills in this market place is the ability to sell yourself, to have a breadth and an adaptability, and an unblinkered approach and to be obviously and committedly divergent rather than convergent thinkers.

We must inculcate adaptability into young people, they in turn can only use that adaptability if they can anticipate for themselves good career moves. You have got to keep your ear to the ground, read the computer press, and the trade press. The people who maintain their adaptability are those who see in the long run which products are going to turn into dead ends, and which are going to turn into a divergent flowering set of opportunities.

Because of this entrepeneurial approach by firms in the industry, and because of the cellular nature of the industry and the speed of the product progression, there is not the time to sit down and argue about whether or not you are going to programme in Cobol or programme in Fortran, because by the time you have resolved the argument, nobody is using either of them any more.

Unionisation of the industry is very low and the incidence of industrial relations friction is very low. Organised labour motivation and conduct would have no place in this, with no functional purpose at all. We therefore have to teach children to be brave and bold, to rely upon themselves, to have confidence in their own competence and in what they can achieve and do. Children must learn the ability to analyse critically their workplace, and know that their workplace will not be the same five years on because of this phenomenon.

Adjusting in the Schools

Michael Trollope, *Director, Educational Department, Newcastle upon Tyne*

A change in the education system, particularly in curriculum, is very much slower than many of us would like because at the top of the schools the curriculum is very much influenced by the examination system. To change the examination system – to make more time available for work that is not for examination purposes – is extremely difficult.

I tried to reduce the number of O Levels and CSEs that young people have to take to give them more time to study the new technologies. But if somebody is very clever he is going to do 8 or 9 'O' levels and that is going to take all his time. It would be better if some schools at least would limit them so that it would be possible for them to take more interest in matters such as the technologies.

I am a great supporter of the careers service, despite the massive cuts of the last 5 years in the education service. Half the public expenditure in Northumberland is on education, so the only service to be really cut is the education service. But we did manage to persuade the council that the county must have an effective careers service with the sort of resources and support to carry out the job.

We have more or less agreed amongst the 16 high schools in our area what we should be teaching in them, and we have included a careers education with a careers adviser to integrate it into the curriculum. But there is little hope of making room to deal with the matters which are the concern of this conference.

In our middle schools, we are now discussing how to get computers and microtechnology under the revised terms of Department of Industry technology programmes. If possible we could extend this to the younger age groups so that we can obtain a co-ordinated programme of curriculum development up to 13 years old. This might be one way of changing curricula in the higher schools.

Where it might be possible to change it for older children is where a high percentage of them are currently working on examinations because most of the high schools believe they are important. An increasing number of sixteen to nineteen year olds, therefore, are staying on at school, and this means that they are withdrawing from the labour market, and are not competing for jobs which others will have more hope of getting. In high schools it is important to establish courses to produce an alternative approach to their education. More important still is that with the development of the new courses for those not thought of as being suitable material for staying on at school, certain one-year City and Guilds courses in addition to the 2-year courses, would be able to provide some experience and practice in the work of micro-technology.

Careers and the Media

Chairman: Geoffrey Goodman

Industrial Editor, Daily Mirror, London

Mike Feldman explained that television will be subject to major changes in the foreseeable future with the development of satellite TV stations, cable TV, and video casettes. As a result there are likely to be many new opportunities for employment.

Anwar Bati emphasised that there are close links between the media. Competition to get in is very tough. Proven experience and track-records are much more important than paper qualifications. One way to get started is to do freelance work for newspapers and/or local radio.

Peter Black pointed out that local radio is one of the fastest growing media, having established itself in a short time despite big problems. His paper emphasised that a whole range of new skills are required. As the formal education system has been incapable of responding fast enough, much of the training is done on the job.

As individuals develop their expertise, new opportunities can open up, although local radio as a whole will not provide a very large number of new jobs.

Peter also described the Capital Job-Finder Service which has been very successful in helping young people in the London area to be placed in employment.

Mike Feldman, *Thames Television, London*

Careers in the media today are virtually non-existent; they are less available than they were yesterday, but I can see a proliferation of careers in television. At the moment there is a TV monopoly in this country. We just have two outlets, BBC and ITV; soon there will be two channels for ITV. Looking ahead further in terms of broadcast material, next year the first European Communications Satellite is being launched giving three additional channels, not including any other satellites.

In the South of England by the end of 1983 we will have access to 8 or 9 additional satellite TV stations. So programming will be necessary for satellite broadcasting.

There are cable operators queueing up to get licences, not just for home entertainment but also for local news programmes. Instead of just having programme material available from national forebears, I foresee a proliferation of local industries.

Already there is the impact of video cassettes on the domestic market. Mushrooming everywhere are video cassette hire shops, video recording hire shops, and video cassette hire facilities at lending libraries.

It is quite amazing to see the proliferation when you think that, in fact, the video cassette market has only reached 2% of domestic consumers so far.

Later this year there will be a video disc–yet another method for getting programming into the home, not from broadcasters, but from other agencies who will need people to produce programmes.

Printed words can now be transmitted on to your television by means of Oracle and Ceefax, which are also capable of transmitting computer programmes into your home.

Next year some of the television manufacturers will be supplying sets with the microprocessors so that you will be able to store computer programmes transmitted by the BBC or ITV. New and old television companies are likely to become involved in electronic publishing giving you articles from magazines which will provide hard copy at the press of a button.

Encyclopaedias are out of date by the time they are printed because of the delay between research and type-setting – you can have the Encyclopaedia Britannica continuously up-dated available in your home on the television screen.

All this I see as growth opportunities for careers in the media, in the near future.

Anwar Bati, *London Weekend Television*

At present, because of financial restraints, newspapers are not taking on any new recruits. LWT are not making any new appointments this year, although they will probably do so in January when the new franchise starts.

It is important to remember that if people want to go in to these kinds of employment they will probably have to wait, and it is better to find an alternative which provides appropriate experience and is likely to be useful later.

There are considerable links between the various media. Newspaper journalists pop up on TV, radio journalists write for newspapers. People work for radio, television and newspapers. Somebody who wanted to end up in television but was offered a job in a newspaper or on a newspaper training scheme, would be well advised to accept, because in the end, as an effective trained journalist he is usually just as much in demand, if not more so, in television than in Fleet Street or anywhere else.

Again, if a person is a feature writer for magazines, it can perhaps help them move on to radio broadcasting, or interviewing. These positions are interchangeable. I think it is a point which is often not recognised by people wanting careers in the media.

On the other hand, it must be emphasised that competition is very tough – there may be 1000 applications for a single job – so you must be sure you really want to make a career in the media. I spent two years trying to get into television.

Experience is a vital factor, too. What that experience should be, though, is a sticky problem. For me it turned out to be journalism, and it was my Feet Street experience which convinced my employers that maybe it was safe to let me into television.

It is very difficult for a person making an appointment to judge how good an applicant will be in a job. It does not matter what experience he has had, what he has done before, it is actually that particular job that is of prime importance.

A piece of advice which is not always recognised if a person wants to go into journalism, is that they should be encouraged at all costs to do as much as possible by themselves, such as freelance articles for newspapers and magazines and minor assignments for local radio stations.

I worked on Radio London where you can learn many of the techniques. That sort of experience may be much more valuable than paper qualifications.

As the media becomes a more and more attractive career, training courses are increasing at various universities or colleges, teaching people about films, television, production or journalism. But do not put too much weight on paper qualifications because in the end, what counts is your ability to cope on the job.

Peter Black, *Capital Radio, London*

Local radio – BBC as well as Independent local commercial radio – will go down in history as one of the fastest growing media, or one of the fastest growing industries in the 1970s and 1980s.

There have been great problems at times, establishing a new industry at a time of massive national recession, in the early 1970s. But, by and large, we have all come through the early problems, so much so that the 41st local radio station was announced the other day by the IBA and they have called for applications to run the franchise in Newport.

So, overall one hopes that the industry is establishing itself and that it will continue in strength; the plan is that in about five years' time there are likely to be about 60 local commercial radio stations in operation. According to the IBA all of these operate a public service without public expenditure – and it means basically that commercial radio exists by what it sells rather than gets its money out of licence fees.

I want to consider two areas, both of which are very relevant to radio. One is the jobs within the radio industry, and the other is what the radio industry does in the generation of jobs.

I do not really think that the staffing levels of any radio station are ever going to be terribly high; my own radio station is probably the biggest in the country, alongside LBC which is the London Broadcasting Company, and we employ 130 people.

The average number of staff ranges from 30 to about 50. Pennine Radio here in Bradford employs about 35 on the staff. That, I think, is about the average for BBC as well as for commercial radio.

When we started there was not much expertise available. A number of us had got our experience overseas – I got mine in the Bush in Australia. Others came from Canada and the United States. A few came from the BBC, but the style of broadcasting is slightly different.

My job is Head of Programme Administration and Special Features. Basically this means that I have got a finger in most pies in the building. It is the sort of job that was built around me as a person rather than having me fitted into a nice, neat, little box. This is largely how radio is staffed. Most people take on so many different functions that the titles become blurred.

There is a lot of training on the job. Indeed, in many cases, this is the only way in which people can become trained in radio. Many of my secretaries leave me, they want to leave me I guess, but also because they go on, hopefully, to bigger and better things. Many of them become personal assistants and producers. Not because they are brilliant, but because people need to come through the ranks and eventually fill the senior positions.

There are some skills which are imported, of course – journalism and engineering are those areas of employment. But, basically, the real talent has yet to show itself, and one of the saddest areas of neglect which I hope will be filled in future, is the ability to write the spoken word. Radio is, after all, an audio medium and yet depends so much on people being able to write what another person will say. Somebody needs to write the traffic information, the news, the commercials, the what's-on information – those little bits that you hear and take for granted. They might in time, come out of a word-processor, but the basic function of getting it all together in the first place has to be worked out. Writing the spoken word is an art for which I will pay dearly – I am looking almost constantly for people who have this ability to write for radio. There are not that many people available with these skills and those that have them ask for high salaries.

In any given hour we broadcast about 60 or 70 individual items of information, but if you sit down for an odd moment and listen carefully to everything that is said on the radio, you will sometimes find quite trite comments, yet usually they are quite relevant pieces of information which you just take for granted.

They might be the time, the weather, or what is coming up on the next programme. More often than not, they are items of real relevance to you as a radio listener.

One hopes that with the proliferation of stations over the next few years, there will be more and more jobs available in radio.

But radio also fulfils a very vital role in helping the audience to understand more about jobs. We are particularly proud of our record in the field of job-creation at Capital Radio – all of which occurred initially quite by accident. It happened because we do not slam doors on people so that when they come to us with an idea we examine it and try to make something out of it.

The job-finder service came out of a ten-minute programme on a Sunday afternoon one day when one of our young girl presenters doing a phone-in on job-availability threw out a random question. She asked if anybody had a job to offer a school leaver. The immediate response was 56 in about 10 minutes – people listening to the radio on a Sunday afternoon phoning in there and then to give a job to a school leaver. After that, over the years, with Government assistance we have got the Capital Job-Finder Service which is, I am told, the most successful placement agency for young people in the whole of London.

The basic philosophy which underlines our whole attitude towards our audience is that, although we do not profess to be the answer to everybody's problems, we will at least receive the problems. And we will always try to find somebody who will be prepared to give help to those who are looking for help. So the station in many ways tries to act as a bridge, as a catalyst, trying to reflect its change. Earlier on, Jim Closs was talking about computerised careers information. He mentioned how ill-prepared he felt young people were for the years ahead.

The age-group 15-18 is one of which we are acutely aware. We are not a young people's radio station despite what it says in the blurb about Capital Radio – 70% of our audience is over the age of 24. But nevertheless a substantial amount of our audience is under 24. We know that there is a very real need in that younger age-group to try and help them through the process of leaving school and getting into their first job. Capital Job-Finder Service is one such. Another, new service called Capital Job-Mate relies on volunteers to share work experience with kids who are trying to get work. Very soon in the New Year we are proposing to run a three-month series based on lifestyle, based on young people leaving school and starting their first job, or coping with the problem of being out of work. It will be a genuine effort to answer a lot of those problems that people 'phone the Job-Finder Service with, for which no immediate answer is known.

Generation of Employment

Chairman: Henry Woods
West & North Yorkshire Centre for Industrial and Education Liaison, Huddersfield

Stan Mendham highlighted some of the characteristics and advantages of private (small) businesses and the contribution they can make to the economy.

Ian Page discussed the work of Bradford Council's Economic Development Unit in creating new jobs and stimulating economic development. Assistance is available for local firms and for those who wish to set up their own business. Help can be provided in obtaining land and premises, loans may be granted and dealings with the Council as a whole (eg. planning) may be facilitated. The Unit refers to itself as 'The Mythbreakers' and is spearheading a campaign to change the image of Bradford and to make Bradford known far and wide. Research is being undertaken to identify emerging industries and it has been established that the potential for tourism in the area is very significant.

Geoff Wood described his work at Sheffield City Polytechnic in providing courses for individuals wishing to set up in business. Details of the courses and the experience gained in running them were presented. 90% of the course participants, many of whom were redundant, have set up their own businesses. So far, not a single one has failed financially.

Working for the Biggest Employee – Private Business

Stan Mendham, *The Forum of Private Business, Cheshire*

The objective of the Forum of Private Business is to promote free enterprise by giving private business people a greater voice in the legislation that will affect their businesses. In this talk I will highlight what I believe to be some of the important characteristics and advantages of private business. By private business I mean those that are privately owned and they are small – 85% of them employ less than 15 people, 40% employ less than 4.

> Private business is a very significant employer and in my opinion is the only part of the economy that is actually increasing its work-force. Therefore, it is capable of making a contribution to solving the unemployment problem.
>
> Private business is not dominant in its field – big business is. This means that big businesses can form cartels and control prices. With private business there is genuine competition and therefore prices cannot be fixed.
>
> The short term objective of private business is not profitability or growth – these days it is survival. Most small businessmen hope to make a reasonable living but, in my view, the over-riding aim is to build up a valuable asset which can be passed on to the children.

In a small firm, the employees are usually close to the person who owns and runs the business – unlike the position of a worker in a large organisation.

In a small business, the workers have to be flexible, individuals must be prepared to tackle more than one job. Otherwise holidays and illness would bring the entire operation to a halt – and there would be no pay for anyone at the end of the week.

Greater participation in the success or failure of a business means that employees are more likely to enjoy the benefits of the wealth they help to create than in a big firm.

When small businesses introduce new technology – normally there is little resistance and the employees adapt very readily. This is because most of them realise that the new technology can make their job easier and help make a bit more profit for everyone.

Employment – The Local Authority's Role

Ian Page, *Economic Development Unit, City of Bradford Metropolitan Council*

I am here really to talk about the local authority's role in job generation. Local authorities, of course, have been involved for a long time with industry, be it in the training at schools and colleges or through the careers service. With an increasing number of people seeking fewer and fewer jobs, questions are bound to be asked about the role of the careers service anyway, and the way in which the service is changing. The education service is becoming involved with all sorts of government schemes, and with special short-term measures, like training workshops. But what local authorities are realising is the need to try to create more full-time, long-lasting employment, or at least be involved in its creation, and in doing so to stimulate industrial and economic development. It is not that new – Councils have had industrial offices for several years now but they have been small. An individual officer, perhaps, working quietly away, talking to local firms, trying to draft new firms with very small budgets. Then new towns, like Milton Keynes and Peterborough spend up to a million pounds a year on promotion and suddenly Leeds and Bradford had to think about attracting new industry. In Bradford, about 18 months ago, the Economic Development Unit was set up to give more emphasis to industrial development.

The industrial development section itself has officers talking to local firms and getting involved with firms interested in coming to the area. There is also a land and valuation section which provides a service to the unit for acquiring, selling or leasing land as well as valuing property for loans.

There is a policy-planning section which deals with the forward planning and the research that is necessary to identify emerging industries. There is a very important section covering all marketing promotion which has grown tremendously to include tourism – now the big growth industry in Bradford. Our main objective is to try to help local industry expand, since we are convinced that the main growth in industrial terms and in employment terms will originate locally. There are far more firms with potential for expansion and development within the city already than are ever going to come in from outside. But there was the priority of attracting new industry because any dynamic economy requires new industry, particularly that which is involved in new technology and we try to concentrate on that field.

Another priority is helping new industry to start from scratch – private businesses and, of course, tourism itself. To attract local firms we had to advertise our existence and people began to ask us what could we do for them. In the present climate it is difficult for any local authority to have massive involvement with employment generation, but at least Bradford has retained assisted area status. Government grants are still available and it is the job of the unit to make these known to local firms.

Next we have a file of all land and property in Bradford in the private and public sector on our computers. This means we can obtain an immediate print-out of all land and property that is available, every price range in different parts of the city, which agent is handling it, whether it is the private sector. We can produce a whole list, monthly, and send it out to our regulars, such as estate agents, and people who are on the look-out for new premises or new land. But we can also have it immediately up-dated not just daily but hourly as information comes in. It is the most up-to-date system of its kind in the country.

We have a system of loans for new or established industry, lending up to £75,000 without committee approval, but with a member involved, and up to £200,000 if it goes before the appropriate committee, for terms up to 20 years. Our priority is not to make money out of financial loans, but to get the money into the economy. That is why we differ from banks. We also try to help local industry to help themselves – in March we ran an exhibition into Amsterdam primarily aimed at firms from Bradford who had not exhibited abroad. We set up a cheap package for £200 which included 4 nights and a full exhibition service. We issued 1600 invitations, but only 11 firms actually made the trip. Those who went did very well indeed. One firm alone signed up £80,000 worth of goods for toys and has now had a repeat order.

Another thing we do is to act as the first point of contact for the local authority. If a local firm has a planning problem or an environmental health problem, we try to make arrangements so that unnecessary difficulties are eliminated. We were set up 18 months ago, and the headline was 'new unit set up to cut red tape', but red tape can be somebody's protection as well as somebody else's hindrance.

On incoming industry the prime objective is to promote Bradford. The Economic Development Unit calls itself the 'Mythbreakers' trying to break:

the myth about Bradford itself with its image of dark satanic mills, environmental deprivation and cloth caps not to mention the Black Panther and Yorkshire Ripper, and

the staid image of local government.

Norman Fowler talked about the three great lies.

The first: 'Of course I will still love you in the morning, darling'

The second: 'The cheque is in the post'

and the third: 'I am from the Council, I am here to help you' so you can appreciate the difficulties we have.

As far as new industry is concerned, we are helping to create more employment opportunities than other West Yorkshire districts, but we also have a high rate of people being made redundant. We believe that the answer is to start with the small firm about 500-1000 square feet.

We produced about 30 small units last year and are now completing the next 30 or so with 12-months licences, and rents of £20-£30 a week.

We are trying to give money to assist the private sector too. At Saltaire, Shipley, in Salt's mill, built by Sir Titus Salt, we worked with the Chamber of Commerce to create Bradford Microfirms in the empty space investing £40,000 to convert the large mill into 80 small units, and already there are 30 people in employment there. One who has only been there 3 months now wants to expand – that is how we see the future, not in the local authority continuing to provide buildings – let the private sector do that. We have shown there is a demand and you make a supply, then that will be filled up.

Where it is appropriate, then we are quite prepared to work in partnership with the private sector. In fact, we believe it will be to the benefit of the whole community if the public and private sectors can work effectively together.

Management Training Courses for New Entrepreneurs

Geoff Wood *Director of the Centre for Innovation and Productivity, Sheffield City Polytechnic*

This paper describes some of the training programmes which we have developed at Sheffield in recent years. My own connection with small firms goes back a long way. Before taking up the post of Director of the Centre for Innovation and Productivity at Sheffield City Polytechnic in 1971, I had spent twenty years in industry and management consultancy. Most of my consultancy experience was with small manufacturing firms employing less than 100 people. All my colleagues had industrial experience before joining the Polytechnic. Our brief was to provide educational services to small firms.

Thanks to the good work of the Industrial Liaison Service which had started in 1965, the Polytechnic had many contacts with small and medium sized firms in

South Yorkshire. Thus, when we offered a range of short courses to these firms we met with a good response. One of our first courses, on production control, attracted 80 participants and we split them into smaller groups. Over the period 1971-76 several thousand managers from small firms participated in our short courses. We also undertook consultancy work to help them improve their performance.

However, we were well aware of a gap in our comprehensive range of services. We were doing little to help the people who wanted to start a business. The reason is simple. We had not found a way of financing such work. Unlike most other departments in the Polytechnic, the Centre for Innovation and Productivity was expected to cover at least half of its costs by earning fees for its activities. People who want to start a business are often short of money and are reluctant to pay full cost fees for training.

Despite our endeavours we were unable to obtain subsidies for this kind of work from the normal educational sources. At that time the political and social climate was still not favourable for small firms. But in recent years the scene has changed completely. We are now spending more time on courses for new entrepreneurs than on courses for established managers.

The change happened in a roundabout way. About five years ago the government recognised that it would need to spend more money on re-training unemployed people for new jobs. As part of this campaign the Manpower Services Commission sponsored some courses for redundant executives to equip them for a change of employer. Some of these courses were organised by the Yorkshire and Humberside Regional Management Centre which is based at Sheffield and has close links with the Polytechnic and other colleges in the region. The courses last about 10 weeks, full time, and have been well received by the participants.

It occurred to us that many of these managers came from large organisations and that the courses did not adequately equip them to transfer into small firms. Accordingly, in co-operation with the Manpower Services Commission, my colleague Patrick Prynne developed a special version of the redundant managers course for those who wished to go into small firms. One of the main features of the course is that each participant carries out a project in a local small firm. We have now run seven such courses with an average of twelve participants, most of whom have successfully found new jobs.

Although these particular courses are not officially recognised as "Start Your Own Business" courses, inevitably some of the participants have in fact started their own businesses. Indeed, one of them could be regarded as our most successful protegé, and he has already bought a Rolls-Royce. However, I have to tell you that his business is helping companies in financial trouble to go into liquidation. 1980 has been a very good year for him in Britain.

In 1977 the man-made fibres division of ICI, who were suffering like their competitors from world wide over-capacity, offered good financial inducement to any staff willing to take early retirement. ICI is well known for looking after its staff and it offered to finance some retraining for those leaving. It says much for the foresight of ICI that they sponsored, in co-operation with the Manpower Services Commission, the first "Start Your Own Business" course run under the aegis of the Regional Management Centre by my colleague John Ellis. The ten week programme consisted partly of classroom work but also much project work by the participants working on their own business under the guidance of the course tutors.

The following year the Manpower Services Commission sponsored another "Start Your Own Business" course, open to anyone already unemployed or willing to give up their present job. There were over 50 applicants for the 12 places and this has been the typical pattern for the six similar courses we have now run. There is a selection panel consisting of one person from the Manpower Services Commission, one of our own staff, a local businessman and a local bank manager. Preference is given to those applicants who can demonstrate evidence of strong commitment for a viable business.

Despite the careful selection, not all the participants have actually started their business. Some of the recent ones are held up by shortage of premises or finance but they will eventually start. However, a few changed their minds during or after the course and have decided not to start a business. Nevertheless, we must not count this as a failure of the course. Many of the people who start businesses without training would have been well advised not to start. But nearly 90 per cent of the participants have started up and, so far, not one has failed financially.

Following the success of the "Start Your Own Business" course in Yorkshire, the Manpower Services Commission has sponsored a slightly different course called the "New Enterprise Programme" at three of the leading business schools at Manchester, London and Durham. The main difference is that these programmes are intended for people who will start a business that will rapidly grow to employ other people whereas the "Start Your Own Business" courses are intended more for the self-employed person or small family business. The other difference is that the participants can apply for funds for research purposes. Participants on both types of programmes can be paid training allowances for living expenses and, of course, their tuition fees are paid by the Manpower Services Commission.

The contents of each programme vary but a typical course covers the following ground. (Table 1)

Table 1

Programme contents for a typical course

1 **The Small Business Scene** The small business environment and climate. Sources of information, advice and assistance. Government policies. Local government attitudes. Relationships with large organisations, especially customers and suppliers.

2 **Business Strategy** The primacy of the customer. What business are you in? Opportunities and resources. Strengths and weaknesses. The marketing mix. Objectives and targets.

3 **Market Research** The need to research your market. Sources of trade and business information. Research methods, telephone interviews, questionnaires. Sampling problems. Analysing results.

4 **Pricing Policy** Pricing decisions, effect on the business. Customer attitudes, competition, costings. Alternative choices.

5 **Sales Promotion and Selling Skills** Techniques of sales promotion. Forms of advertising. Getting value for money. Organising your sales. Face to face selling. Identifying customers' needs and wants. Overcoming objections.

6 **Financial Management** The balance sheet. How money flows through the business. The profit and loss account. Distinction between profit and cash flow. How to go bankrupt whilst making a profit.

7 **Sources of Finance** Personal savings; family loans; overdrafts; bank loans; retained profits; leasing and hire purchase; government grants. How to apply for loans and grants.

8 **Bookkeeping** Need for financial records. The cash book; bank book; day books; sales ledger; purchase ledger; nominal ledger. Statutory requirements. Practical examples of different businesses.

9 **Simple Accounts** Extracting key figures. Monthly profit statements. Provisions and prepayments. The trial balance. Vital ratios to watch.

10 **Budgeting** The need for control. Forecasts and budgets. Sales forecasts. Direct cost and overhead budgets. Profit budgets. Simple control statements.

11 **Cash Management** The business lifeblood. Fixed and working capital needs. Simple cash budgets. Overtrading. Drawings and overheads. Taking corrective action.

12 **Banking Arrangements** Services provided by banks. Choosing the right bank. How to get the best service from your bank. Keeping the bank manager informed.

13 **Professional Accounting Advisers** Services provided by accountants. Choosing a professional firm. How you can help your accountant to help you.

14 **Income Tax and Corporation Tax** Implications for the self-employed and small company. The tax return. Income, outgoings, allowances, capital gains. Business profits and losses. Opening and closing years. Sole traders, partnerships and limited companies. Tax planning. Tax avoidance and tax evasion. The Inland Revenue viewpoint.

15 **Value Added Tax** The scope and coverage of VAT. Standard rate; higher rate; zero rate and exemption. Mandatory registration; exemption limit, voluntary registration. VAT returns and accounting procedures. The Customs and Excise viewpoint.

16 **Employee Pay and Taxes** Minimum rates of pay, union and employer arrangements. Gross pay; incentives, overtime; holiday pay. Deductions; National Insurance; Income Tax; savings schemes. Tax codes, tax tables, tax forms. Starters and leavers.

17 **Legal Structures of Business** Sole traders, partnerships and limited companies. Relative advantages and disadvantages. Registration of business names. Duties and obligations of partners; termination of partnership. Registering a limited company. Memorandum of Association. Articles of Association. Appointment and powers of directors and secretary. Company meetings. Statutory requirements.

18 **Consumer Legislation** Freedom of contract. Duties of the seller. Duties of the manufacturer. Consumer credit. Copyright, trade marks and restrictive practices. Theft by customers and staff.

19 **Employment Legislation** Contracts of employment. Statutory and common law provisions. Employer's statutory duties. Health and safety at work. Disputes at work. Grievance and disciplinary procedures.

20 **Insurance** Types of insurance needed; premises, equipment, stock, vehicles, employer's liability, public liability, consequential loss, personal accident, etc. Personal insurance and pension arrangements for the self-employed and company directors.

21 **Property and Premises** Business premises requirements. Planning permission. Statutory regulations, health and safety. Rented premises, rent agreements, rights of the tenant, rights of the landlord. Leasehold premises. Ground rents. Freehold premises. Rateable values. Working from home.

22 **Managing Your Time** Deciding your objectives. Establishing priorities. Key result areas. Identifying your strengths and weaknesses. Making the best use of your time.

23 **Managing Your Project** Setting up a business plan. Defining main features and potential problems. Corrective action plan. Where to get help.

24 **Experience of Other People** Contributions by successful and unsuccessful entrepreneurs. Experience of previous course participants. Books on how to start and run your own business.

The list of subjects shown in Table 1 does not cover all aspects of the programme but it does give a good indication of the main areas.

However, it cannot be over-emphasised that the participants spend only about half of the ten weeks on these subjects. The rest of the time they are working on projects connected with their own business. The nature and scope of the project for each participant is chosen in consultation with the course director and the participant's personal tutor.

Soon after the start of the course each participant is assigned a personal tutor who helps the participant with his/her project. Whenever possible, the personal tutor has expertise in the area of the participant's project. Thus some participants will be assigned to a marketing expert, others to a financial expert.

The personal tutor does not work full time with the participant. Each personal tutor may have four or five people to look after. The role of the personal tutor is to guide and help the participant, not to do the work for him. There are regular periods for consultation between the participant and his personal tutor but inevitably urgent problems crop up which result in telephone calls to the tutors at their homes in the evenings. This means that the people running the course or acting as personal tutors must be prepared to go far beyond the normal duties of a lecturer. They must have a strong sense of commitment to helping the new entrepreneurs to get started.

The projects vary widely in scope and depth. Some people need to give priority to market research. Others need to obtain further finance from a bank or other source. Some need to obtain suitable premises for their business. Others need to develop budgets for profit, cash flow and capital expenditure.

Sometimes the result of the project or the development of the budgets shows that the original business idea is not viable or that there is some other good reason for not going ahead. Most of the people who come on these courses change their minds about some aspect of their business before the end of the course. Some of them even change their minds about the type of business!

The types of business started by these new entrepreneurs are very varied. Table 2 gives an indication of the different businesses that have been started, or in some cases considered and subsequently changed, by the participants of our courses. They range from the simply conventional to the highly unusual. We have ceased to be surprised by the novel ideas developed by these new entrepreneurs.

One of the most salutary experiences for all the participants is that in the last week of the course they have to present the results of their project, and their latest thoughts about their business, to the other course participants and the course tutors. This forces them to think hard about their business. Often the questions from the other participants are more searching than those from the course tutors. This experience is invaluable and it is a pity that more of the people who start businesses without help do not get the opportunity to undergo this critical examination. It might save many of them from making mistakes that prove costly to themselves and others.

It can be seen from the description of this programme that it is radically different from the conventional academic management programme. We are not concerned with intellectual rigour and academic balance. We are only concerned with helping these new entrepreneurs to set up and run their businesses. Thus the whole emphasis is practical and pragmatic. We are not concerned with the theoretical aspects of management and entrepreneurship, though we like to think that our work is based on sound principles. The test of our performance is not the number and quality of papers we have written and published but the number of successful students.

I emphasise this point because small business is still not an academically respectable subject. It is regarded as low level work whereas masters programmes and doctorates are high level work. Yet I and my colleagues would argue that it is much more difficult and demanding to teach new entrepreneurs than to deal with normal postgraduate work in management. Indeed we have deliberately had to avoid using most of the normal management lecturers on these courses. This is not

Table 2

Types of Businesses started or considered by participants of the "Start your own business" courses.

Advertising Design Agency
Advertising Year books
Agricultural Equipment
Bed Manufacturing
Building & Contracting
Business Consultancies
Cafes & Restaurants
Car Service Bays
Charity Fund Raising
Catering for Weddings etc
Chemical Process Consultancy
Chinese Takeaway Food
Clog Manufacture
Coach Trimming
Colour Television Repair
Commercial Artwork
Domestic Appliance Repair
Educational Tapes Production
Elderly People's Home
Employment Agencies
English Language School (for foreign businessmen)
Environmental Control
Financial Consultancies
Fishing Equipment
Furniture Manufacture
High Quality Confectionery
Hobbycrafts Retail
Hotels
Import-Export Agencies
Industrial Consultancy
Laboratory Equipment
Launderettes
Leather Goods Wholesaling
Liquidation Consultancy
Machine Tool Manufacture
Management Consultancies
Motor Car Dealerships
Newsagents Shops
Pet Shops
Photography
Plumbing Fittings Manufacture
Property Conversions
Radio Enthusiasts Shop
Recruitment Consultancy
Roof Contractors
Secretarial Agencies
Silver Antique Jewellery
Specialist Book Shop
Sports Goods Shop
Sportswear Manufacture
Stained Glass Crafts
Stonemason
Sub-post Offices
Tailoring
Taxis & Car Hire
Tile Wholesale & Retail
Time Sharing for Boats
Toy Manufacture
Trailer Manufacture
Travel Agencies
Underwater Diving

to decry their expertise in their own fields. But most of them have no experience of small business let alone the problems of the new entrepreneurs.

Thus much of the formal teaching on the course is undertaken by people who spend most of their time working in or with small firms. We use bank managers, accountants, tax experts, insurance people, and advisers from various agencies concerned with small firms. Some of the most useful 'lecturers' are small businessmen and women who come to talk about their experiences.

It is not easy to find people who are both good at running a small business and able and willing to talk to new entrepreneurs. However, we have now built up a panel of such people and they prove to be a popular part of the course. We are very grateful to one person who has failed twice in business but is willing to come along and talk about it and respond to the searching questions. Participants say they learn a great deal by hearing at first hand about other people's mistakes.

There is a great deal more to these programmes than can be described in this paper but there is one vital question. Is it worth it? Is there any proof that the time and money spent on these programmes pays off? How do we know that it would not be better to leave these people alone and let them learn the way that most entrepreneurs have done in the past?

The short answer is that we don't really know, at least not yet. These programmes have been running for only four years and, naturally, most of the participants have only been in business for less than two years. We are trying to keep in touch with all the participants to follow their progress but with the shortage of money in the public sector we have to give more priority to new courses.

However, the Manpower Services Commission is carrying out research on a national basis to assess the results of these programmes and, so far, the results are encouraging. Bearing in mind that the original objective of these programmes was to help to ease the unemployment problem and to help to create more new jobs, the programmes are worthwhile. It can cost up to £100,000 of public money per job created in the large firm sector whereas these new jobs in the small firms sector are not costing even one tenth of that sum.

The latest development in this field is that we are now running similar courses for redundant executives from one particular large firm. These are funded entirely by the company and not by the public purse. The courses are run on the company's premises and the participants are still on the payroll. Thus they have not undergone the traumatic experience that so many redundant managers go through before they come on our other courses.

The courses are open to any manager who has agreed terms for voluntary redundancy. Thus there is not always the same level of commitment that we have found on the publicly funded courses. Nevertheless, it shows an enlightened attitude on the part of the large firm to offer its employees the opportunity, free of charge, to learn how to run their own business.

We believe that we are only at the beginning of a great new development in British education. Until recently, the attitude of the state has been that if a person aspires to become a doctor, a lawyer, an architect, an engineer or any other professional, they could receive subsidised education but if they aspire to run their own business they could get no such help.

Now the new entrepreneurs are beginning to get the help they deserve. Admittedly a ten week course is a lot less help than the average graduate receives in educational terms but it is better than none. I look forward to the day when the state gives as much help to the new entrepreneurs – the wealth creators – as it has given for so long to other members of the community who tend to consume more wealth than they create.